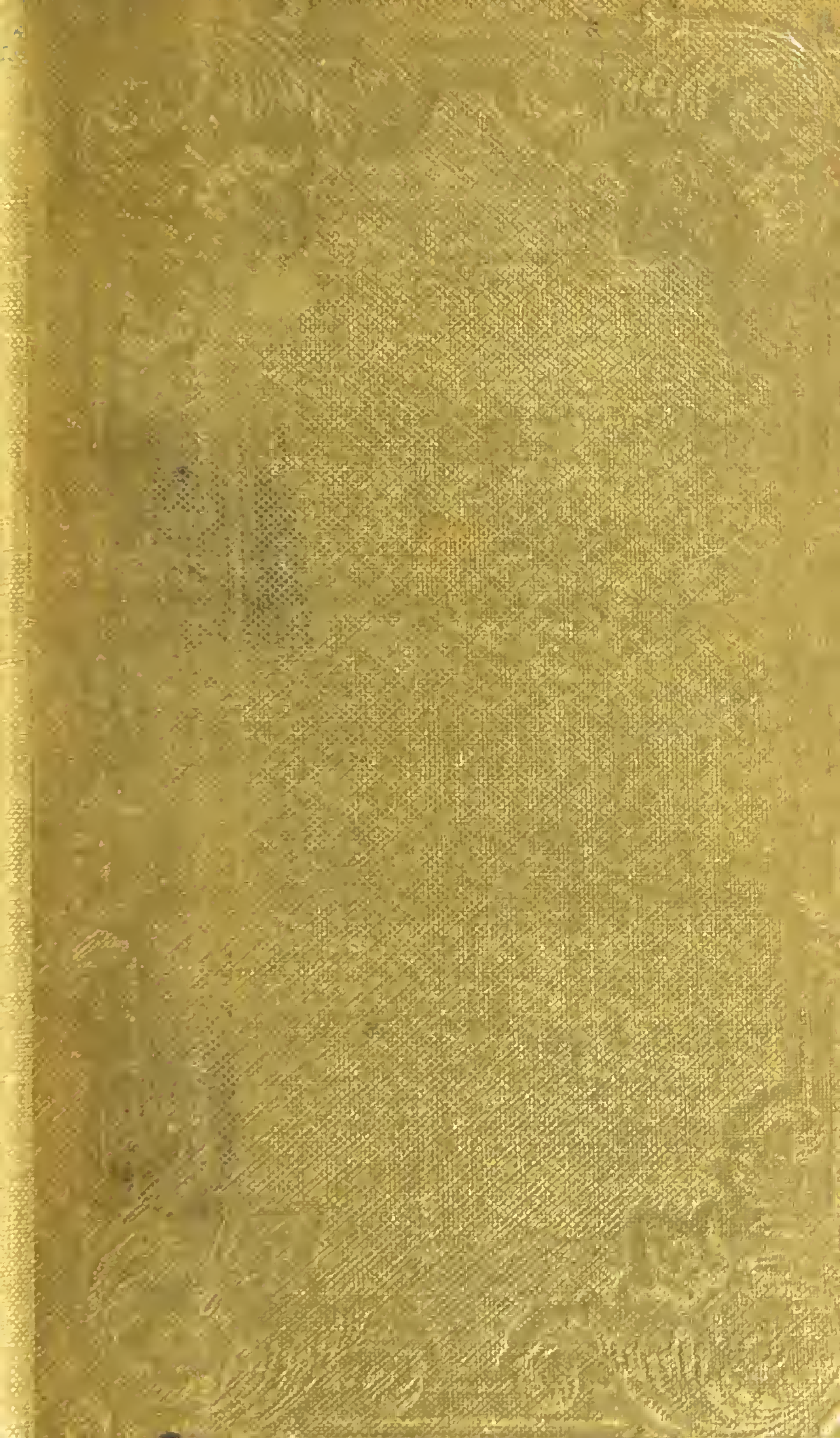

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A MANUAL

OF

OBSTETRICS.

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A MANUAL

OF

OBSTETRICS:

Theoretical and Practical.

BY

W. TYLER SMITH, M.D.

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ST. MARY'S HOSPITAL.

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PREFACE.

The present Volume consists of the substance of a Course of Lectures which appeared in the *Lancet* in the year 1856. It has always been my custom to lecture either extemporaneously or from brief notes; so that when in the autumn of 1855 I was asked to publish a Course on Obstetrics, I had but little time for preparation, and, with few exceptions, the whole was written in the year 1856. This, with the busy avocations of practice, involved no slight amount of labour, and may plead as some excuse for any shortcomings which may be evident to the critical reader.

I was subsequently invited by Mr. Churchill to re-cast the Lectures into the form of a Manual, as one of his Series; and I willingly consented to do this, feeling there could be no higher object for a professional man than that of being as extensively useful as possible. I have been able to spare less time than I could have wished for this task, but I trust that some originality will be found in the work, and that it will contribute, in the hands of the student and practitioner, to the advancement of that branch of medicine of which it treats.

When I began to publish, I determined to give the authority for every woodcut taken from other works; I soon found, however, that obstetric authors, of all countries, from the time of Mauriceau downwards, had copied each other so freely, without acknowledgment, as to render it difficult or impossible to trace the originals. I therefore relinquished the idea, and must content myself by stating that I have contributed in the present work upwards of twenty new engravings to the common stock.

I have to express my acknowledgment to many friends and practitioners who have furnished me with hints, advice, and cases, and especially I desire to mention the kindness I have received from my friends Dr. Matthews Duncan, Dr. Oldham, and Dr. Vernon.

UPPER GROSVENOR-STREET,
April 19*th*, 1858.

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MANUAL

OF

OBSTETRICS.

INTRODUCTION.

THE knowledge of the modes of generation in different animals, of the anatomy and physiology of the parts concerned in reproduction in the human female, of the development of the embryo, and the pathological lesions to which the mother and ovum are liable, with the rules of practice derived from observation and experience, constitute the foundation of the SCIENCE OF OBSTETRICS. On the other hand, the ART OF MIDWIFERY consists of the application of knowledge thus extensively derived, in the prevention and treatment of the accidents and diseases incident to pregnancy, parturition, and the puerperal state. The object of both science and art is the assurance of the safety of mother and offspring in these several conditions; and it adds to the importance of this branch of medicine, that if any comparison of the value of one human life with another can properly be made, none is more precious than that of the woman in childbirth; for at no other time can the lives of two human beings be so closely united. Obstetrics have also an important relation to morals, since it sometimes happens, in the casualties of gestation and labour, that the lives of the mother and child come to some extent into competition, and the decision upon which the death of the child rests, with a view to the safety of the mother, must be taken by the accoucheur. These various considerations, no less than the scope of the subject itself, should imbue all who may be engaged in the study and practice of this department of medicine with a sense of the responsibility under which they lie, to neglect no means of information which may contribute to make them sound and efficient practitioners.

In the Arrangement of the matter of the present volume, an attempt has been made to follow a natural method, placing those subjects which mutually illustrate each other as nearly as possible in juxtaposition. For instance, instead of treating of the pelvis and the fœtal cranium at the commencement, these subjects have been treated of immediately before the mechanism of labour, with which they are so obviously concerned. In like manner, the deformities of the pelvis have been considered in the chapters preceding the subject of difficult labour from pelvic distortion. Indeed, throughout, without losing sight of a certain order or development, more has been thought of the mutual dependence of the various subjects upon each other, than of a strictly systematic method of proceeding.

By way of conclusion, the various causes of Death from Childbirth have been grouped together and compared; and the means by which we may reasonably hope that the amount of mortality, both as regards the mother and child, will be considerably diminished hereafter, have been insisted upon.

CHAPTER I.

GENERATION.

In this the first chapter of a work on the Principles and Practice of Obstetrics, it is proposed to draw attention to some general considerations concerning the reproduction and development of living beings. Beginning with matters relating to the most simple modes by which the propagation of animals can be effected, we may easily ascend to the study of the higher forms of reproduction, until we arrive at the generation of the human species. It will be found, as we proceed, that there are no races so low in the scale of creation but that the history of their generative phenomena is calculated to throw light upon the same functions in classes of the highest rank in the animal kingdom. This circumstance must plead as an excuse for attempting to deal, at the commencement of the present work, with the elements or principles of generation.

At the very threshold of the subject, we are met by the long-agitated question of Spontaneous or Equivocal Generation. Can any form of animal life be produced upon the globe we inhabit, out of dead inanimate matter, or, indeed, otherwise than as part of a procession or series of living organisms, every generation of which must depend for its existence upon the generations that have preceded it? In former times, many facts connected with the generation of the humbler forms of living matter seemed altogether inexplicable; and naturalists and physiologists were driven to a belief in the doctrine that, under special circumstances, such as the decomposition of animal and vegetable structures, some of the lower forms of animal existence might be developed spontaneously. The progress of knowledge has, however, steadily diminished the number of these mysteries; and it may be said that, in recent days, the last stronghold of the believers in spontaneous generation has been the conditions under which the Infusoria and Entozoa can be produced.

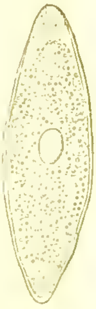
From any vegetable infusion, under certain regulations as regards light, air, and temperature, myriads of microscopical infusoria are called into existence. The same infusions uniformly produce the same animalcules, and the lowest forms of infusorial life are those which first appear. The results are the same when water, which has been boiled or distilled, is used; and observers of eminence have declared that they have seen the *débris* of vegetable matter, while undergoing decomposition, transformed into infusoria. Others have believed that animalcules may be produced, by the action of electricity, from silica and similar inorganic matters. It may, however, be said, at the present time, with regard to the infusoria, that the difficulties in the way of explaining their almost omnipresence have disappeared, and that their production, except under natural circumstances, can be satisfactorily disproved.

The different modes of propagation in the Infusoria have been investigated, and it is known that in their most simple forms, the perfect infusoria, and in other cases the germs, are almost innumerable, and of well nigh unextinguishable vitality. One animalcule, the *Monas crepusculus*, is $\frac{1}{2000}$ of a line in diameter; and it is remarked by Professor Owen that a single drop of water may contain not less than five hundred millions of these minute beings. The drop evaporated, these vast populations, greater in number than the living inhabitants of the world, become dry, and preserve their latent life in the air and in the dust of the earth, to be revivified on the occurrence of the conditions necessary to their existence. Not a mote of the sunbeam but is peopled with these animalcular organisms. Their power of resisting destructive agencies is not one of their least wonderful properties. They live in water under ice, or enclosed in vesicles in the ice itself. Fontana revived some specimens of Rotifera after they had been exposed to the sun for upwards of two years in dry sand; and Spallanzani and Schultze have revived them after four years of desiccation. Other animalcules, in drying, burst, and liberate myriads of germs, which preserve their vitality under almost every conceivable circumstance. These and similar facts prove that no particle of air, dust, or water can be selected which does not contain infusoria or their germs, thus rendering it almost certain that the vegetable infusion does nothing more than favour the restoration of dried animalcules, or the development of their invisible germs. But the *experimentum crucis* respecting the spontaneous generation of the infusoria has been applied by Schwann and Schultze. The access of air, which no doubt contains infusoria or their germs, is known to be necessary to the production of animalcules in vegetable infusions. One of these experimenters passed the air employed through caustic potash and through strong sulphuric acid; and the other through iron tubes heated to redness, the infusions used having been previously boiled. Under these conditions no infusoria were produced, though a rapid development of animalcules occurred on the admission of air to similar infusions, when no such precautions were observed.

As regards the Entozoa, the presumptive evidence in favour of their spontaneous generation was still more conclusive than in the case of the infusoria. Entozoa are found in situations to which they could not be supposed to have access by any natural means, and particular entozoa are only met with in particular localities and organs. The *Cysticercus cellulosæ* is found in the anterior chamber of the eye, in the choroid plexus, and in the substance of the heart. The *Trichina spiralis* infests the voluntary muscles, and the *Strongylus gigas* the parenchyma of the kidney. A Diplostomum in the aqueous humour, has itself been found to be infested with parasitic animalcules. Entozoa have been detected in the fœtus in utero, in the blood. and in the eggs of oviparous animals. Such facts appeared to present insuperable difficulties to the explanation of the existence of entozoa in their special habitats, unless upon the supposition that they are produced spontaneously. It came also to be known that many of the higher forms of entozoa possess complicated organs of generation, and produce ova and embryos in abundance, which themselves became the subject of observation. For a time, however, this knowledge only increased the difficulty. How, for instance, could entozoa reach the fœtus, or enter the eye, when their ova were known to greatly exceed the diameter of the capillary vessels?

It was at last discovered, that the entozoa, particularly in their embryo forms, possess a special boring apparatus, which had been noticed by John Hunter in some species, by means of which they are able to make their way through the solid tissues of the body with extraordinary facility, producing little or no disturbance in their progress, and leaving no traces of their operations behind them. It was also found that a vast variety of special provisions existed for the diffusion and localization of these creatures. The numbers, too, of the ova of some of the entozoa are immense. A single specimen of the *Tænia serrata*, an entozoon which infests the dog, will produce twenty-five millions of ova! while a mature female of the *Ascaris lumbricoides* will contain upwards of sixty millions! Many of them pass through several phases of existence in different animals before they arrive at the perfect state, provision being made for their transfer from one animal to another. It is believed that in every species of tape-worm, two animals are at least necessary for their complete development, and of these two animals, the one generally stands in the relation of food, or prey, to the other. Thus the scolex, or embryo head of the *Tænia crassicolis*, is found in the mouse, while the perfect tænia infests the intestines of the cat. The mouse is of course the means of introducing the embryo of the tænia into the larger animal. The power of the entozoa in resisting destructive agents is even greater than the infusoria. Some of these worms of complicated structure remain alive after being boiled a considerable time; others are re-animated after being frozen for several weeks. Their ova have still greater powers of self-preservation. These and similar facts respecting their numbers, modes of generation, indestructibility, and powers of penetrating animal tissues, appear sufficient to explain all the seeming mysteries respecting the entozoa, without resorting to the theory of spontaneous generation.

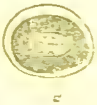
FIG. 1.



Gregarina.

The most simple form of animal life is that met with in the Gregarinæ, a genus of microscopic entozoa found in the internal organs of worms and insects. The Gregarina consists essentially of a single cell, or of a cell-wall with its contained fluid, and a central nucleus. (Fig. 1.) It moves by contraction of its cell-wall, and only differs from a vegetable cell by the possession of contractility, and its solubility in acetic acid. In the simplest infusoria, the polygastrian animalcules, a class below the entozoa in the animal series, the same monadiform organization is found; and throughout the infusoria, although many additions, in the shape of cilia and internal organs, occur, the type of a cell, with a central nucleus, or nuclei, is preserved. This central portion consists of hyaline matter, of an amber colour, which is supposed to be fatty in character, and is believed to bear a resemblance to the spermatic particles of higher animals. The Chlamydomonas may be cited as one of the simplest of these infusoria. (Fig. 2.)

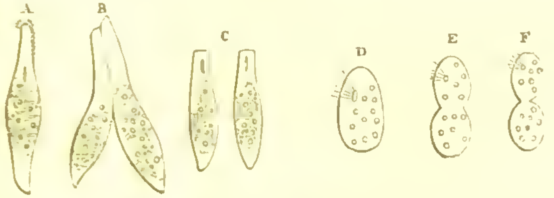
FIG. 2.



Chlamydomonas.
n. Hyaline nucleus.

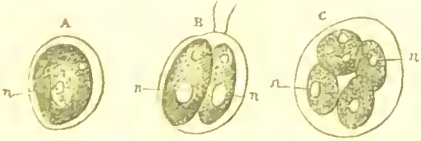
The primary and most simple type of Reproduction, that which is found in these unicellular, monadiform animalcules, is that of spontaneous fission, or Fissiparous Generation, as it is called. In this mode of reproduction, in the most simple forms of infusoria, a single unicellular animalcule divides into two or more cells, which, after their division, become similar to the parent cell. The first infusorial animalcule ever known, the *Vorticella convallaria*, discovered by Lœuwenhoeck nearly two hundred years ago, multiplies itself in this manner. Sometimes the fissure takes place longitudinally, at others transversely (Fig. 3), a notch first appearing at the point of subsequent division, which enlarges until the separation is nearly completed, when the two cells struggle, by means of their cilia, until they are free from each other, and swim off as independent animalcules. In some infusoria the fission consists in a simple division of one cell into two. In others, they divide but still remain connected in groups, as a chain or in a spherical mass. The latter is the case with the *Volvox globator*, a well-known animalcule. Instances are met with in which the divisions of succeeding generations are regular multiples of each other, as two, four, eight, and so on. This occurs, for instance, in the *Chlamydomonas*. (Fig. 4.) In the process of fission, the nucleus is

FIG. 3.



A, B, C. Longitudinal fission of elongated infusoria. D, E, F. Transverse fission of oval animalcules.

FIG. 4.

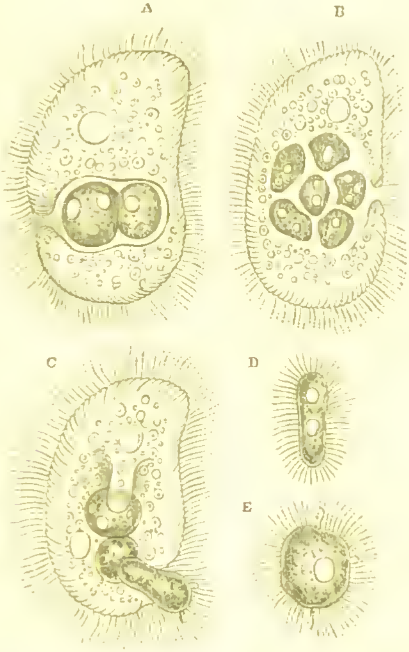


A, B, C. Multiple fission of Chlamydomonas. *n*. Nuclei.

always the first part to divide, and it is this cleavage of the nuclear portion which rules the segmentation of the whole cell. In these simple organisms, the sperm and germ-force resides in the nucleus or nuclear particles—every nucleated infusorial cell, multiplying in this way, being, from its birth, as it were, impregnated and ready to propagate its kind by fission. No diminution of the reproductive force is caused by successive fissions, each generation of purely fissiparous animalcules having the same power as its progenitors. Many infusoria multiply by other modes of generation as well as by fission, but the rate of increase by this means alone is very great. The *Paramæcium aurelia,* if well fed, divides every twenty-four hours, its progeny in successive generations continuing to divide in the same ratio. In this way, in the course of four weeks, one animalcule will produce upwards of two hundred and fifty millions of new beings. This fissiparous mode of generation is found not only in the Infusoria and Entozoa, but in Polypi, Medusæ, and the Annulata. It is in the infusoria also that the first acts of Parturition are observed. In the *Loxodes Bursaria,* four or five cells are formed in the interior of the animalcule, which are gradually developed into embryos. These embryos make their way slowly through the tissues of the parent and escape externally. No aperture or channel exists previously, and the situation of the parturient escape of the embryo seems entirely to depend upon accident. (Fig. 5.) At whatever part of the parent organism the embryo is developed, there a way is made for its escape. Sometimes two or three embryos are escaping from different parts of the parent at the same time. From this simple beginning, the extrusion of the ova and embryo goes on in the animal series, until it reaches the complexity and difficulty witnessed in the higher mammalia and in the human species.

The next form of reproduction met with in the animal kingdom is Gemmiparous Generation, in which the offspring arise from the parent in the shape of gemmæ, or buds, which acquire a similar organization to the parent animal, and separate to assume an independent existence. In the *Hydra viridis,* for instance, a prominence first appears upon the surface of the animal, which gradually assumes the form of a miniature polyp. It contains a cavity, which, in the first instance, communicates with the stomach of the parent Hydra. An oval aperture, surrounded with tentacles, is developed at its free extremity. At first the food digested in the stomachal cavity of the parent supplies the gemmule, but, after a time, the young polyp begins to catch food, and contributes to the support of itself and parent. At length, its connexion with the parent polyp becomes slender, and it separates altogether. (Fig. 6.) Another mode of gemmiparous generation is where, as in the sponges, small free gemmules, or buds, are separated from the body of the parent animal, and become developed into perfect individuals. The parts of the body from which gemmation takes place in different animals, are very various. In some, it may occur at any part of the surface of the body; in others, the gemmules are formed in the digestive cavity, and extruded from the oral aperture. In the medusæ, the gemmæ arise from the ovaries, stomach, proboscis, and tentacles. In other

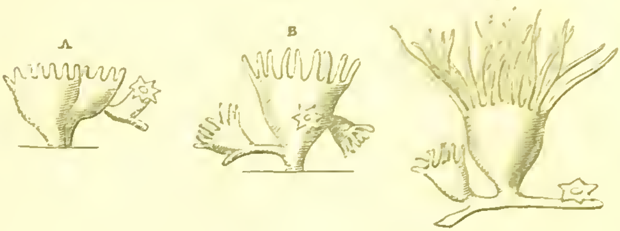
FIG. 5.



A, B. Formation of germs and embryos in Loxodes Bursaria. C. The process of parturition. D. E. Free, moving embryos.

cases, as in the *Alcyonidium elegans*, an Alcyonian zoophyte, the tubercles which constitute the gemmæ, or buds, are pro-

FIG. 6.

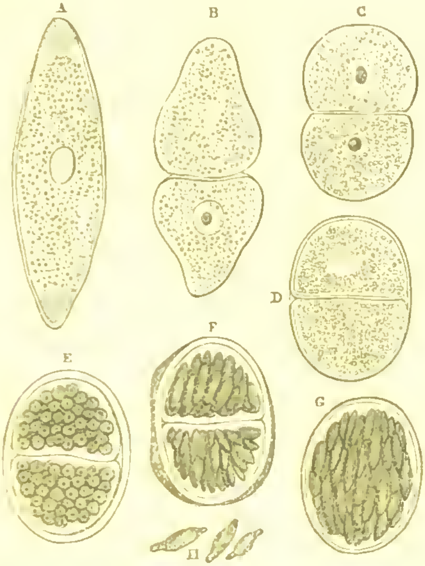


A, B, C. Polypoid Acalephs, giving off gemmæ or buds.

duced in particular strips of tegumentary membrane. In some of the gemmiparous animals, new creatures may be multiplied to almost any extent by mechanical division. The *Hydra viridis* may be divided longitudinally or transversely into several parts, and each fragment will become a perfect polyp; or if a wound is made in the body of the animal, a new polyp sprouts from the site of injury. The gemmiparous form of generation is met with in a large variety of animals. It exists in the Infusoria, Entozoa, Polypi, Medusæ, Annulata, and Tunicata. In the Nereis, and in some of the Myriapoda, gemmation forms an important part of the reproductive process. In the former, a constriction first appears in the tail of the animal, immediately behind which the head of a new nereis is developed, and the posterior division becomes separated from the anterior, or parent nereis, as a perfect animal.

The earliest traces of a Diœcious mode of reproduction in animals, in which two individuals are engaged in the production of offspring, is met with in the humble Gregarina already mentioned, in what has been termed Conjugate Generation. These microscopical entozoa propagate not only by fission, but by a process termed conjugation. In the latter mode of generation, two of the elongated cells or animalcules are said by Stein and other observers to approach each other; the two ends which are in opposition become flattened, so that the two conjoined animalcules resemble a single Gregarina in shape. A complete fusion of the granular contents of the two individuals takes place, and from the joint mass a number of small bodies are produced, which are believed to be the embryos of this monadiform entozoon. (Fig. 7.) Other in-

FIG. 7.

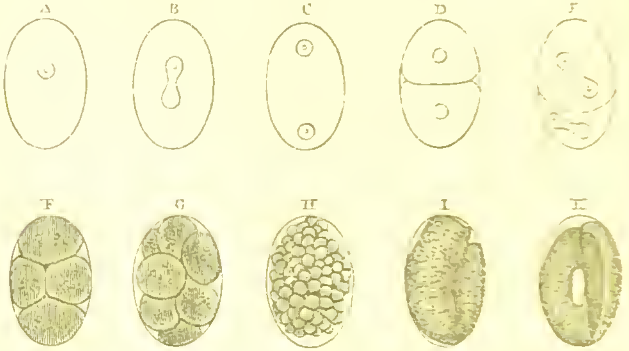


Conjugation of Gregarinæ. A. Single Gregarina. B, C, D. Two animalcules in a state of conjugation. E, F, G. Formation of embryos. H. Free embryos.

stances of conjugate generation have been observed by Kölliker, Siebold, and Cohn. This mode of generation appears to be quite wanting in anything of an ordinary sexual character. The conjugating Gregarinæ appear to be precisely similar to each other, and their reproduction seems to be by a kind of duplicate fission. It is, however, impossible not to be struck with the similarity of the process of conjugation, and the union of the sperm cell and germ cell in the higher animals, to which sex has been added in the scheme of reproduction. In the latter case, the sperm and germ cells unite to produce, by division and subdivision, the particles forming the germ mass, out of which the embryo is evolved. As soon as sexual generation commences, two kinds of cells are required in the process of reproduction—one produced in the ovarium, the other in the testes. In the lower classes, these two organs are frequently found upon the same individual, constituting complete hermaphrodite generation. In other instances the individuals are hermaphrodite, but the mutual congress of two or more animals is necessary for fertilization. In the higher classes hermaphrodism disappears, and the ovarium and testis, with the sperm cell and germ cell, belong to different animals and sexes.

The present seems to be the proper place for making some general remarks on the subjects of Fissiparous and Gemmiparous Generation, and the relation of these processes to the acts of reproduction in the higher animals. The principle of fission is not limited to animals in which it constitutes the chief mode of generation. It extends in a certain degree to the higher forms of animal reproduction. In oviparous animals and mammalia, it may be said that the dehiscence of the ovule, or of the impregnated ovum, from the ovarium, is a kind of fission. A still closer analogy to the phenomena of fission is found in the early changes in the interior of the mammalian ovum after impregnation, and indeed of the ovum of all animals multiplying by sexual generation. (Fig. 8.) These changes are similar to those which have been referred to as occurring in the unicellular infusoria. That which will hereafter have to be described as the segmentation or cleavage of the yolk, consists in the division and subdivision of the embryo cell, and

FIG. 8.



Development of Ascaris acuminata by repeated fission of the germ cell. Type of development in all animals produced from ova.

is almost identical with the multiple fission of the Chlamydomonas—an analogy first pointed out by the late Dr. Martin Barry. The only difference is that in the Chlamydomonas and Gregarina the divisions and subdivisions produce independent and perfect animals; whereas in the mammalian ovum the fission results in a mass of germ cells, intended to pass on to higher developments. In animals the subjects of sexual generation, the male element is also formed by the rupture of the primary germ cells secreted by the testes, and the conversion of their nuclear matter into spermatozoa, which may, in fact, be considered as secondary germ cells. It may also be said that the human fabric is the result of the fission, an innumerable number of times repeated, of the single fertilized embryo cell; the multitudes of cells produced by the rupture and fission of generation after generation of cells, and by the conversion of their nuclei in turn into parent cells, being moulded by plastic morphological forces, into bone, muscle, nerve, blood, and the other elements of which the body is composed. The similarity of the ciliated epithelial cell of the mucous membranes, to the ciliated unicellular infusoria is very palpable. It is of myriads of such cells, modified in infinite ways, that the human organism is constructed. In this way we can to a certain extent realize the idea of Buffon, when he said that all animal and vegetable bodies were aggregations of animalcules; or the more positive remark of Oken, that the higher animals, and man himself, were agglomerations of infusoria.

Generation by means of buds or gemmæ is still more extensive than reproduction by fission. In gemmiparous animals reproductive nuclei are scattered throughout the structures and tissues of the parent organisms; it is a fission occurring, not, as it were, in the whole animal, but in particular parts. The mode of reproduction by gemmation extends higher than fissiparous generation, being found, as we have said, as high as the Tunicata, and it is concerned in that peculiar form of reproduction termed Alternate Generation, which is found amongst insects. But the principle of gemmation is not lost at the point when it ceases to be a mode of generation. It is concerned in the reproduction of lost parts. In gemmiparous generation, animals are formed, not from ova, or from the fission of primary reproductive cells, but from secondary or derivative germ cells, placed in reserve in the tissues of animals. In the triton, or the lobster, in which the tail or claw is reproduced, the new formation occurs from derivative germ cells placed in the tail or claw—that is, a reserve of derivative germ cells, not used in the general development, is deposited in different parts of the body, and come into use when regeneration follows the loss of particular parts or organs. In mammalia, the extremities in the fœtus are always formed by budding or gemmation. It is believed by some observers that in the human fœtus, if a limb be amputated spontaneously in utero, at an early period, there is an attempt at the production of a new limb by gemmation. In some of the remarkable cases of spontaneous amputation of limbs in utero, first investigated by Dr. Montgomery and Prof. Simpson, the amputated limb is found in the uterus, and from the stump, small or rudimentary fingers or toes are seen to be growing, which remain visible in after life.

One of the most remarkable phenomena in the history of reproduction is that of alternate generation, first investigated by Bonnet, Reaumur, Steenstrup, and others, and to which great significance has been given by Prof. Owen, under the name of Parthogenesis, or virgin-procreation. In many forms of animal life—as, for instance, in the Salpæ amongst mollusca, the Distomata amongst entozoa, and the Aphides amongst insects—it is found that the parent animal gives birth to an embryo different to itself; that this embryo lives as an independent animal, but gives birth, without sexual intercourse, to another, and to a successive series, until at length a progeny is formed bearing the likeness of the original parent.

The observations of Agassiz go to prove that the infusoria generally are only the ova of the entozoa, the polygastric animalcule being the larval condition of the parasitical worms. In the Distoma, the embryos have at first the form of ciliated monads, and these are metamorphosed into Gregariniform worms. In the interior of each of the latter, numbers of Cercariform, or tailed animalcules, are developed, which in turn become true Distomata. In the winged Aphis, the ova are deposited by the parent insect, and in due time produce larval, wingless aphides. Each virgin aphis of this brood will produce other similar broods, without contact with the male. This *Lucina sine concubitu* has been observed to go on to the eleventh generation, the last generation being winged, and male and female. These have intercourse, another fecundation occurs, and in the following summer the phenomena which have been described again occur.

The explanation of these cases is, that in the first instance the coïtus fertilizes the ovum, and part of the derivative germ cells produced from the embryo cell, instead of being consumed in the development of the first generation of aphides, are kept as a reserve. In the second generation, these derivative germ cells give origin to a new generation of derivative germinal cells, of which a reserve remains as before, and so on until the spermatic force of the germ cells is exhausted. To illustrate this matter, let us look to the early development of the mammalian ovum. The embryo cell divides into two, these two into four, the four into eight, and it is not until the segmentation has affected the whole mass of the germ and yolk that the formation of the new individual begins. But suppose each generation of germ cells, occurring in this fission or segmentation, to have the power of going on to the production of new individuals, we should then have the power observed in the virgin aphides, where each generation of germ cells goes on to the production of a larval aphis before a new fission or segmentation of the derivative germ cells takes place. We may see traces of this power of the spermatic element, to fertilize or modify more than one generation of ova and germ cells, in other animals than those in which perfect parthogenesis occurs. For instance, a single coïtus of the cock fertilizes, not only the eggs which are mature in the ovary, but those which are immature, so that eggs which reach maturity a long time after coïtus are found to be fertilized. The parthogenetic influence may, I think, even be seen in the mammalia and in the human female. In the well-known case of the mare covered by the Quagga, the foals produced afterwards, by intercourse with her own kind, still bore the stripes of the quagga. In the human female, it is found that a woman having married and borne children by her husband, becomes a widow, marries a second time, and bears children to her second husband which have the lineaments of her first husband. The same occurs in the lower animals, and it is difficult to explain the matter in any other way than by supposing that one coitus must have influenced several generations of ova. The relation of such phenomena to parthogenesis is obvious.

The next step in the process of reproduction brings us to Oviparous Generation. This form of generation is very early met with in the animal series. Ehrenberg discovered in many of the Rotiferous animalcules distinct male and female organs, and generation by means of fecundated ova. In some of the more simple infusoria, ova appear to be formed in the general parenchyma of the body without any sexual operation, and to be extruded in the form of reticulated masses. In the lower part of the zoological scale, oviparous generation is mixed up with fissiparous and gemmiparous generation, and there seems to be hardly any difference between the production of free gemmules to be developed apart from the parent, and the formation and elimination of ova from the infusoria, in whom distinct sex is wanting. It is in Insects, Fishes, Reptiles, and Birds, that oviparous generation reaches its full development. In insects, the ova, which consist of a germinal vesicle, yolk, albuminous and shelly coverings, are very small, and the embryo is early extruded from the shell in a larval state, but fitted to acquire its own nourishment, and passing through numerous metamorphoses before it reaches the perfect condition. All insects are diœcious, or of distinct sex, and the impregnation of the ova occurs within the body of the female. In fishes, the sexes are also distinct, and in this class we get the first commencement of the ovarium as it exists in the higher vertebrata and mammalia. In the lower types of fishes the ovarium consists of a mere vascular lamina, in which the ova are formed and thrown off into the abdominal cavity, from which they escape by orifices near the anal aperture. In the higher specimens of this class an oviduct is added for the purpose of conveying the ova from the ovarium. The ova of fishes are generally impregnated out of the body, but in some cases impregnation and development to a certain extent occur within the ovary, the male having a rudimentary intromittent organ, and the embryo is expelled in a living state. In reptiles the oviduct is a permanent condition: the ova are generally fecundated out of the body, *in transitu*, in the lower genera; but in the more advanced specimens of this class ova are impregnated within the body of the female, and in some of them the young are born alive. In birds, the ova are contained in ovaries, and the egg reaches its highest state of development, consisting of the germinal vesicle and a large yolk, an extensive layer of albumen, or white, being also added so as to support the development of the young, with various membranes for the protection of the egg and the maturation of the ovum. Parental affection, of which there are traces in insects and fishes, is present to a very great degree in the case of the bird.

In the Mammalia we have, in all cases, viviparous generation, though some are termed ovovivipara, but the instances of ovoviviparous generation in birds, amphibia, and fishes, in which the eggs are hatched in the body of the parents, are very different from any of the forms of generation met with in the mammalia. In the Monotrematous type there is a near approach to the bird; and as the phenomena of generation in the monotremes have not been actually observed, it is only by analogical reasoning that Prof. Owen has arrived at the conclusion that the Ornithorhyncus brings forth its young alive. In Marsupial reproduction, the impregnated ovum remains a short time in the uterus, and receives nourishment, but at a very early period of development it is transferred from the uterus to the marsupium or pouch, where it hangs by the nipple during the rest of its fœtal development. Neither in the monotremata nor the marsupiata have any vascular connexion between the parents and the ovum been observed. The uterus enlarges, but it is probably by a secretion found within its cavity, and absorbed by the yolk, that the young embryo is nourished and developed.

In the higher mammalia, a true vascular connexion is formed between the ovum and the mother by means of the chorion and the mucous membrane of the uterus; and the embryo, after a prolonged term of intra-uterine development, is expelled to pass through another protracted phase of maternal nutrition from the mammæ. In all mammalia, except in the very lowest types, we have the separation of the generative canal from the urinary and intestinal organs. The generative organs reach their greatest state of development in the human species, and consist of parts adapted to Coïtus, Ovulation, Menstruation, Impregnation, Utero-Gestation, Parturition, and Lactation—functions which are placed in relation to the highest affections, and the sacred sentiment of parental love. The vascular intra-uterine connexion between the mother and fœtus acquires its most perfect development in the Placenta of the human species, and it is mainly owing to this intimate vascular relation, the intricacy of the organs of generation, the arrangements of the bony pelvis in accordance with the upright position, and the development of the human intellect, as evidenced by the comparatively large size of the brain and cranium of the human fœtus, that the pains and perils of childbirth, and the necessity for the cultivation and practice of OBSTETRICS, are produced.

Having dealt thus far in general considerations, let us now proceed to a more minute consideration of the various steps in the anatomy, physiology, pathology, and therapeutics of reproduction, in the human species.

CHAPTER II.

THE EXTERNAL PARTS OF GENERATION.

The organs of Generation in the human female are generally divided into the External, or those chiefly concerned in coïtus, and the Internal, or those employed in the development of the ovum. To the former belong the mons veneris, the labia majora and minora, the clitoris, the hymen or carunculæ myrtiformes, the perinæum, the vagina, and the mammæ; the latter includes the uterus and its ligaments, the Fallopian tubes, and the ovaria. Both the internal and external organs have important relations to the processes of utero-gestation and parturition.

The Mons Veneris is a cushion-like layer of adipose and cellular tissue, developed at the time of puberty, situated in front of, and above, the pubis. It is covered by a thick integument, studded with hair. Its use is to guard the pubis from mechanical violence during intercourse, and to act like the hair of the axilla in defending this part of the body from the effects of friction and perspiration. In general, the hair of the mons is short and curled; but, in sterile women, I have sometimes observed it to be straight, and longer or shorter than usual—these conditions being often indicative of a feeble development of the internal organs of generation.

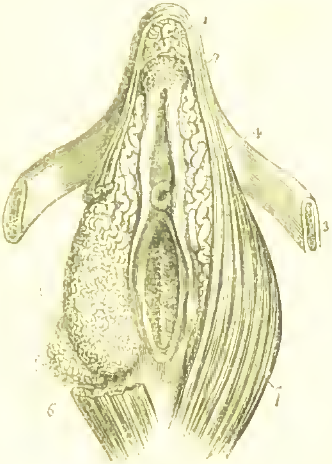
The Labia Majora, or labia pudendi, are two folds extending downwards on each side from the mons veneris to the perinæum. They are thick, and lie in contact, above; but below they become thinner and are separated from each other. Externally, the labia majora are covered by skin, which has a smaller quantity of hair upon it than the mons; but, internally, they are lined with the commencement of the genito-urinary mucous membrane, and are studded with numerous sebaceous follicles, which secrete a fatty and odorous matter. When this is allowed, from want of cleanliness, to accumulate, it becomes of calcareous colour and hardness. The union of the labia above constitutes the superior commissure; and that below, the inferior commissure of the pudenda. Within the posterior commissure, a fold of mucous membrane stretches across between the labia, which has been called the fourchette, though the same name is frequently applied to the commissure itself, as the commencement of the perinæum. The fold, or frenulum referred to, is almost always lacerated in first labours; but before this laceration has taken place, and particularly during labour, a distinct depression, or fossa, can be felt between the frenulum and the edge of the perinæum, termed the fossa navicularis.

About an inch beneath the anterior commissure, and between the labia majora, is found the Clitoris, which resembles a small penis, and is, in fact, the analogue of the penis of the male. It is composed of two corpora cavernosa, which are attached by crura to the rami of the ischium and pubis, and meet together in the median line. Each of these bodies is enveloped in a thin fibrous sheath. The clitoris is imperforate, but at its point there is a small spongy or cavernous mass, called the glans, and covered by a fold of integument, or imperfect prepuce. It has two muscles—the erectores clitoridis, representing the erectores penis, arising from the rami of the pubis and ischium, as low down as the tuberosities, and inserted into the crura clitoridis. A suspensory ligament connects the clitoris with the pubis. It is supplied with blood by the internal pudic artery, and possesses a dorsal vein, similar to the vena dorsalis penis. The clitoris is capable of erection, and when in the erectile state is almost of cartilaginous hardness. It is the chief seat of sexual sensibility, constituting, according to Dr. Meigs, "the organ of touch to the aphrodisiac sense." In hysterical females, it is sometimes subject to a constant erection, almost similar to that which obtains in priapism in the male. During this condition, it is difficult, or impossible to pass urine—a point first noticed, I believe, by Dr. Silvester, of Clapham. These are, in fact, the cases in which, in hysterical subjects, the catheter is often required. I have observed the clitoris to be subject to a peculiar mechanical displacement, or dislocation, in females who have been the subjects of self-abuse. It becomes loose, probably from relaxation of the suspensory ligament, and is raised higher over the pubis than is natural. When such women marry, they are often deficient in the sexual orgasm during coïtus, in consequence of the removal of the clitoris from its proper position. The clitoris is larger, comparatively, and more prominent, in the infant than the adult. It is subject to hypertrophy, but the special sense is not increased in such cases in proportion to the hypertrophic growth. The clitoris receives large branches from the internal pudic nerves; and in some of the lower animals, Pacinian bodies have been found in this organ.

The Labia Minora, or nymphæ, are two folds of mucous membrane extending from the prepuce of the clitoris, downwards and outwards, for about an inch and a half or two inches. Externally there is a furrow betwixt these folds and the labia majora, covered with the commencing mucous membrane, and studded with numerous fat-glands; and, internally, they form the commencement of the vagina. On their inner surface may be seen the openings of numerous mucous follicles, by which mucus is secreted for the lubrication of the ostium vaginæ. The separated nymphæ have been compared to the fissured male urethra from arrest of development in hypospadia; and the analogues of the bulb and corpora spongiosa are found deeply seated behind the nymphæ. These consist of a plexus of veins lying on each side of the clitoris, called the pars intermedia; and of two leech-shaped masses of reticulated veins inclosed in a fibrous sheath. These bulbous masses were known to the older anatomists, De Graaf and Santorini, but they have been described anew by Mr. Guthrie, Kobelt, and others. The bulbs are situated below the pars intermedia, and behind the middle and lower portions of the nymphæ. They have received various names, such as plexus retiformes, bulbi vestibuli, and crura clitoridis interna. The objects both of the labia majora and minora are, no doubt, to defend the genital fissure, to afford an extensive sexual surface, and to facilitate the expansion and dilatation of the pudenda during parturition.

Below the clitoris and between the nymphæ there is a grooved space, about an inch long, pointed above, and broader below, termed the Vestibule. In the median line, and at the lower portion of the vestibule, is situated the Meatus Urinarius, consisting of a raised and irregular rim of mucous membrane, with an opening in the middle. The eminence is caused by a slight puckering of the mucous membrane by the contractile fibres which keep the meatus closed under ordinary circumstances, an arrangement which admits of considerable distension during micturition, or in catheterism. The meatus is generally so prominent as to be readily felt by the experienced finger. (Fig. 9.)

FIG. 9.



1. Vena dorsalis. 2. Glans clitoridis 3. Crus clitoridis. 4. Meatus urinarius. 5. Bulbus vestibuli. 6. Vulvo-vaginal gland. 7. Sphincter vaginæ. The plexus of veins constituting the pars intermedia, is seen on each side of the nymphæ.

Catheterism of the female bladder is one of the minor operations at which the accoucheur ought to be expert, and in this place a few remarks may be made on the mode of finding the urethra, and passing the catheter. We have to draw off the urine in the unimpregnated state; during pregnancy and labour, or after delivery; and also under certain circumstances in which the meatus and urethra may be considerably displaced. The situation of the meatus has already been indicated, and the length of the urethra is about an inch and a quarter. The meatus itself is on a level with the summit of the pubic arch, the bladder being in the natural condition above the pubis, and the direction of the urethra is backwards and upwards, or the same as the lower part of the anterior wall of the vagina, in which it is imbedded. The urethra may be felt rolling like a cord under the finger between the vaginal wall and the symphysis pubis.

There are two or three modes of finding the urethra in catheterism, without exposing the patient—a matter which, of course, should always be avoided, if possible. The woman may be placed on her back or on the left side, and the attendant, having found the anterior commissure with the index finger of his left hand, should pass the finger down lightly over the clitoris to the bottom of the vestibule, when he may feel the borders of the raised meatus, and, with a cultivated sense of touch, the aperture in its centre can easily be made out. The catheter should be passed over the point of the finger, which may be used both as a director, and to steady the parts, into the canal, when it generally glides readily into the bladder, the handle of the instrument being a little depressed while it is passing. It must be remembered that the meatus is an aperture in a mucous surface, and it may be searched for with the point of the catheter, if the canal is not readily found. Occasionally, however, the meatus is in a state of firm contraction, and must be hit exactly in order to pass the catheter. This spasmodic contraction of the meatus, and of the whole canal, is often met with in hysterical subjects. In another and better mode of performing the operation, the accoucheur first finds the cord-like urethra in the upper wall of the vagina, and in withdrawing the index finger, feels for the meatus, at the angle formed by the lower part of the vagina and the vestibule, and introduces the instrument with the other hand. In a third mode, the operator knowing the relation of the meatus to the pubic arch, and possessing tact and experience, goes to it at once, the patient being on her left side, with the knees raised. In this way only one hand need be used. It scarcely need be said that the latter is the most perfect method of operating, and one which all should aim at being able to perform.

Various circumstances alter the anatomical relations of the meatus and urethra. The meatus may be so flaccid and relaxed that it is found with difficulty, or, after painful and lingering labours, the external parts may become so swollen from inflammation, and the effects of pressure, as to render it no easy matter to find the urethra by the touch alone. In prolapsus occurring during pregnancy, the direction of the meatus becomes altered so as to point towards the sacrum, or coccyx. In retroversion the meatus is drawn upwards, and the direction of the upper part of the canal is turned backwards and downwards, while in anteversion of the gravid uterus the urethra is dragged upwards; but the upper part of the canal is turned more forwards than usual. In the unimpregnated state the urethra may be displaced by ovarian tumours, fibrous tumours of the uterus, and by the various alterations of position to which the uterus is liable. Sometimes one of the mucous lacunæ, close to the meatus, may be so enlarged as to admit a small-sized catheter, and the operator may suppose he has reached the bladder, while the instrument is really in a cul de sac. The length of the urethra and the possibility of this mistake should always therefore be borne in mind. An inexperienced hand may pass the instrument along the upper floor of the vagina, but the resistance of the sides of the urethra, or a slight clasping of the instrument by the canal, will generally assure the operator that he is in the right passage.

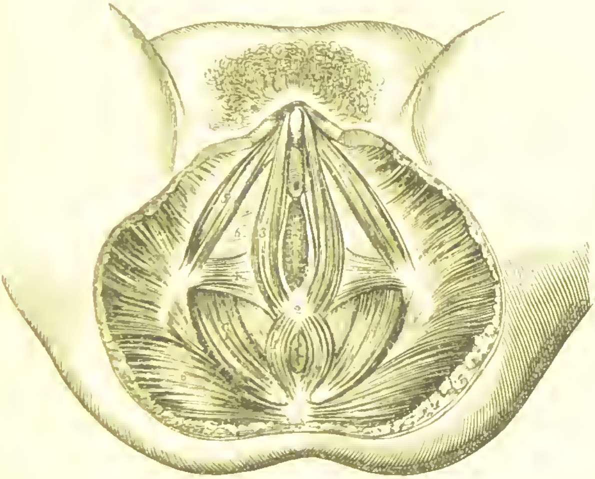
The instruments used are, a common number 8 or 10 male catheter, with or without a stilette; a gum-elastic catheter very similar to the male catheter, except that it is somewhat shorter; and a flattened silver catheter. The stop of the silver catheter is perfect, and the urine can be drawn off by it without wetting the patient; but during labour, when this is not of so much consequence, a gum-elastic catheter is to be preferred, and if used without a stilette, it is scarcely possible for any accident to occur. It should be seen that the apertures of the catheter are free, and the point of the instrument should be dipped in oil or glycerine. The catheter should be held gently in the fingers, being lightly poised rather than grasped, and no force should be used, as both bladder and meatus have been perforated accidentally. It should be borne in mind that in case of difficulty it is far better to expose the patient than to use force, or incur the risk of injury.

Immediately below the orifice of the meatus is the Ostium Vaginæ, slightly oval in form, and of variable diameter, according to age, childbearing, &c. In the virgin this opening is partly closed by a membranous fold, constituting the Hymen, which is commonly crescentic in form, the concave free border being turned upwards. Sometimes the hymen is deficient or wanting altogether, either congenitally or as the result of accident, so that its absence is no absolute proof of intercourse. In other cases it is circular in shape, or possesses several cribriform openings, or it may be thickened and imperforate. During intercourse this membrane is generally ruptured; but cases occur in which it is so strong and resisting, that surgical interference in the shape of a crucial incision is required. In some women, on the other hand, it is so distensible, that it readily yields, instead of tearing, and remains unbroken, even after perfect and habitual intercourse. This may account for the circumstance mentioned by Parent Duchatelet, that in some prostitutes the vagina resembles the virgin state. Rupture of the hymen is by no means necessary to conception, as impregnation sometimes occurs through the cribriform hymen, or when only a very small aperture exists. Usually, after intercourse the place of the hymen is occupied by several fleshy eminences, termed the Carunculæ Myrtiformes, which some anatomists believe to be formed by the cicatrization of the ruptured hymen, while others, as M. Rigaud, believe them to consist of reduplications of the mucous membrane, which exist before the loss of the hymen. There is a considerable amount of contractile tissue in the situation of the carunculæ, and in some cases the irritation and spasmodic painful contraction at this point is so great as to render intercourse difficult or impossible long after marriage.

Externally to the carunculæ, on each side, and on the surface of the nymphæ, are two small openings, admitting the point of an Anel's probe, which are the ducts of the Vulvo-Vaginal Glands. These glands, which were known to Bartholine and Duvernay, and called after their names, have recently been described with great accuracy and minuteness by M. Huguier. They are seated on each side of the vulva, outside and below the bulbi vestibuli, and in shape and size have been compared to apricot stones; their ducts are about half an inch long. The vulvo-vaginal glands secrete a clear albuminous mucus, of a penetrating odour, during intercourse, which Huguier and Scanzoni believe can be ejaculated by the involuntary contractions of the neighbouring muscles. These glands are considered the analogues of Cowper's glands in the male. M. Huguier points out that they may be the seat of abscess from inflammation, or of encysted tumour, from obliteration of their ducts.

The Perinæum is the space between the posterior commissure and the margin of the anus. To the obstetrician the anatomy of this part is matter of great interest; though it must be confessed, that the anatomy of the male perinæum has been cultivated somewhat to the neglect of that of the female. In the ordinary state, it is from an inch to an inch and a half in length, but during labour it elongates to twice or four times this size. At the fourchette, the perinæum is comparatively thin, but towards the anus it is of considerable thickness. It is composed chiefly of skin, cellular tissue, muscular fibres, and the mucous membrane of the vagina. There are certain peculiarities in the arrangements of the muscles of the perinæum which deserve notice. They are all inserted by at least one extremity into tendinous structures and fasciæ. This occurs in the case of the sphincter ani, levatores ani, coccygei, transversales perinæi, erectores clitoridis, and sphincter vaginæ. The fibres of many of these muscles are indistinct as compared with other muscles, and are mixed up with a considerable quantity of elastic dartoid tissue. These circumstances greatly facilitate the dilatation of the perinæum at the time of labour. It must be borne in mind, that the perinæum has a two-fold function; one to dilate during the passage of the child; the other, to support the pelvic viscera under other conditions. When its structures are rigid and undilatable, we have the danger of laceration; and when its dilatability is excessive, the patient is liable to prolapsus and other displacements of the uterus and vagina. A similar arrangement with regard to their insertion, holds good in the case of the abdominal muscles, and facilitates their distension by the gravid uterus during pregnancy. (Fig. 10.)

FIG. 10.



1. Sphincter ani. 2. Tendinous point of perinæum. 3. Sphincter vaginæ. 4. Transversus perinæi. 5. Erector clitoridis. 6. Aponeurosis. 7. Levator ani. 8. Gluteus maximus.

The Vagina extends between the internal and external parts of generation; but, as it is concerned with the latter in coïtus, and bears no share in the development of the ovum, it may be conveniently described with the external organs. This canal is slightly curved, the concave surface being upwards and forwards, and its direction is nearly that of the outlet, and lower portion of the middle, of the pelvis. The anterior wall of the vagina is about four inches long, the posterior being five or six inches in length. This is partly on account of the greater length of the lower curve, and partly because of the way in which the uterus is inserted into the vagina. The axis of the uterus is nearly the same as the axis of the inlet of the pelvis, so that the uterus is inserted, as it were, into the anterior wall of the vagina, while the posterior wall is prolonged behind the os uteri. This canal is longer in virgins than in women who have borne children, particularly multipara. It is also longer in the middle months of pregnancy than in the beginning, or towards the termination of gestation. It is elongated in some cases of fibrous or ovarian tumour, when the tumour is supported above the brim of the pelvis, and raises the uterus with it. The diameter of the vagina varies in different parts of the canal, being smaller at the outlet than in the middle and upper portions. In ordinary cases, the sides of the vagina are in contact; and this acts as a valvular arrangement for preventing the access of air to the uterus. As regards structure, the vagina is composed of an external, middle, and mucous coat or tissue. The external layer consists of cellular tissue, which connects it anteriorly with the bladder and urethra; laterally with the levatores ani, and posteriorly with the rectum and the peritoneum. The connexion with the peritoneum is in the upper and posterior fourth of the vagina, where the peritoneal cavity dips down between the vagina and the rectum. The middle coat is dense and fibro-cellular, and is similar in structure to the proper uterine tissue, with which it is continuous at the os and cervix uteri. It has been compared by Cruveilhier and other anatomists to the dartos. During pregnancy, it partakes of the growth of the uterine muscular tissue, though in a less degree. The mucous lining of the vagina has upon the mesial line of its anterior and posterior surfaces two ridges, termed the columnæ rugarum. From these two columns, folds of mucous membrane project at nearly right angles, the folds being most numerous at the lower part of the passage. The rugæ of the vagina are most distinct in virgins, less so in women accustomed to intercourse, and they nearly or altogether disappear in women who have borne children. The vagina also becomes smooth in women who have never borne children as age advances. The objects of the rugæ are to yield an extensive surface for sensation, and to provide for the distension of the canal during labour.

Examined microscopically, the vaginal mucous surface is found to be studded with vascular papillæ, which have been described and figured by Dr. Franz Kilian, and which are probably the seat of the great sensibility of the organ. The whole surface is covered by a thick layer of tesselated or squamous epithelium. Writers on the subject generally describe the vagina as containing great numbers of mucous follicles, which are supposed to secrete the mucus which lubricates the vagina at ordinary times, and especially at the time of parturition. In my own examinations, I failed to find any large number of glands, except at the outlet of the vagina; and with this exception, the mucus of the vagina is, I believe, produced by the epithelium, and consists of plasma and epithelial particles. The secretion of the vagina, as pointed out by M. Donné, and Dr. Whitehead, of Manchester, is distinctly acid. The acid secretion is believed to be serviceable in preserving the fluidity of the sanguineous menstrual secretion, and thus of facilitating its escape from the vagina. It has also an antiseptic effect, and tends to prevent the decomposition of coagula. It likewise contributes, with the rugæ of the vagina, to stimulate the penis during coïtus. Beside the coats of the vagina already described, it is surrounded, particularly near the outlet of the passage, with a plexus of veins, resembling erectile tissue; and it possesses a muscle, the sphincter vaginæ, arising from the tendinous point of the perinæum, inclosing the bulbi vestibuli, and inserted into the clitoris. A fasciculus of the muscle crosses the vena dorsalis, and aids in promoting the turgescence of the clitoris. The arteries of the vagina are branches of the internal iliac, and the veins empty themselves into the internal vein. It derives its nerves from the hypogastric plexus, and from the third and fourth sacral nerves.

The vagina resembles skin quite as much as mucous membrane, and in cases of procidentia, where it is exposed, it becomes converted into dermoid tissue. The chief functions of the vagina are as an organ of sensation and introception, and as a canal for the passage of the fœtus and the catamenial secretion. It also undoubtedly possesses some contractile power, both voluntary and reflex. This is seen in the expulsion of coagula during menstruation, and after parturition, and in its contraction on the introduction of the speculum. The vagina likewise contracts with considerable force during the passage of the child, and it sometimes expels the placenta after labour, when it has been forced into the passage by the uterus.

It may be necessary to say a word respecting the physiology of Coïtus, as regards the female. The sexual orgasm of the male is well recognised. We know that it begins with excitement of the glans penis, and ends in spasmodic contraction of the vesiculæ seminales and ejaculatores muscles, this contraction being attended by the sensorial orgasm. The female is considered "passive," both by Prof. Müller and Dr. Carpenter, during coïtus, but this is evidently a mistake. The sexual "paroxysm" in the female was fully recognised by John Hunter, and is as distinct as that of the male. It begins in the clitoris, and ends in an orgasm or paroxysm of sensation. Whether the sensation excites any spasmodic reflex action may be a question. Is the ejaculation of the secretion of the vulvo-vaginal glands described by M. Huguier, the analogue of emission in the male? Whytt and the older anatomists believed in the contractions of Fallopian tubes during intercourse. These points may be considered as yet unsettled, but of the existence of the sensorial orgasm there can be no doubt, and its absence constitutes impotence in the female. It should be observed, however, that the orgasm is not at all necessary to conception. Women to whom Heberden applied the term "frigida" conceive as well as those who are perfect in this respect. Impregnation consists in the meeting of the spermatozoa and the ovule, and can never take place at the moment of coïtus. The union of the male and female elements of reproduction in the uterus or Fallopian tubes is no more attended by sensation than is the conjugation of the Gregarinæ.

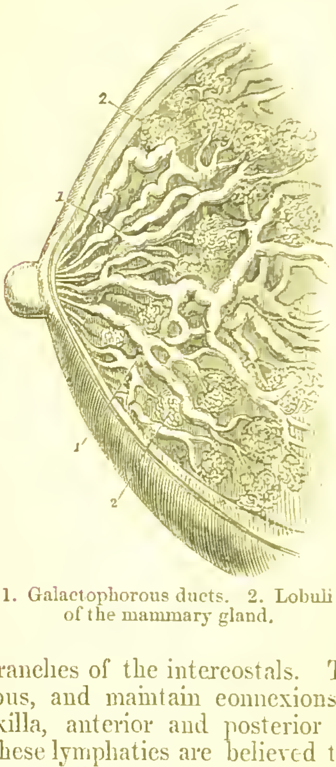
An account of the external organs of generation would not be complete without a description of the Mammæ, from which the infant derives its nourishment for some time after birth. The mammary glands are placed upon the pectoralis major muscle on each side, extending from the third to the seventh rib. This situation, which is in great measure peculiar to the human female,—the mammæ being, in the vast majority of animals, placed upon the abdomen,—is evidently adapted to the nursing of the infant while supported in the arms of its mother. These glands are hemispherical in shape, the external aspect being convex, the posterior flat or slightly concave. The left breast is generally the larger of the two, and is more used in nursing. Each gland is enveloped in a fibrous or dartoid capsule, which dips down between the various portions of the gland, and is surrounded by a considerable quantity of adipose tissue.

The intimate structure of each gland consists of numerous lobes, which are divisible into smaller and smaller lobuli, until we arrive at the ultimate follicles of which the substance of the gland is composed. The follicles and ducts are covered with a layer of epithelium. It is by the growth and multiplication of the nuclei, and the bursting of the epithelial cells, which have been found by Prof. Goodsir to be filled with milky fluid, that the lacteal secretion is produced. These follicles or vesicles, having cæcal extremities, empty themselves into small tubes, which unite with each other, and proceed in a tortuous course towards the centre of the gland, becoming larger and larger, and terminating in from ten to fifteen galactophorous tubes, which are collected together, but without much inosculation, near the base of the nipple. As they approach the nipple, they dilate, to form sinuses or ampullæ, which act as reservoirs for the milk. Underneath the nipple they contract again, and pass by separate ducts to the surface of the mamilla, where their openings are found in depressions of the mucous membrane. The lactiferous tubes are wanting in valves, but are closed at their external apertures by sphincter-like fibres.

The surface of the gland is covered by delicate integument, and at its summit is placed the nipple, which, in the virgin, or in women who have not borne children, is conoidal in shape, but in nursing women assumes a flattened or cribriform appearance at its extremity. The site of the nipple is on a level with the fourth rib. This, the most vascular part of the breast, contains a certain quantity of erectile tissue, which makes the nipple turgid, and tends to dilate the openings of the milk-ducts, under irritation. The turgescence is generally accompanied by pleasurable sensations, the surface of the nipple being covered by numerous nervous papillæ. The sensation of "the draught," which is excited by emotional causes, the suckling of the child, or, as a reflex action, by the ingestion of blood or drink into the stomach, is felt in the nipple, and is followed by a rapid secretion of milk. The nipple contains a considerable quantity of dartoid contractile tissue, which is probably concerned in the closure and dilatation of the milk-ducts. The action of this tissue and the capsule covering the gland, contributes to the expulsion of the milk.

The base of the nipple is surrounded by an areola, of a pinkish hue in the virgin, but in the pregnant woman pigment cells are deposited in it, and the areola becomes darker in colour. On the surface of the areola are numerous small tubercles, or sebaceous glands, which secrete a fatty matter, intended to defend the nipple during lactation. Sudoriferous glands are also found upon the areola.

FIG. 11.



1. Galactophorous ducts. 2. Lobuli of the mammary gland.

The mammary glands receive their supply of blood from the thoracic intercostal, internal mammary, and epigastric arteries. The veins are those accompanying these arteries. Around the nipple, the veins are arranged in a circular manner, the circulus venosus of Haller. During pregnancy, as Mr. Nunn has pointed out, owing to the interference with the internal circulation by the pressure of the gravid uterus, the circulation through the internal mammary and epigastric arteries, and the veins of the surface of the abdomen and thorax, is very much increased—a mechanical condition which probably contributes to the development and supply of blood to the mammary glands during gestation. The nerves are chiefly branches of the intercostals. The lymphatics are very numerous, and maintain connexions with the lymphatics of the axilla, anterior and posterior mediastinæ, and other parts. These lymphatics are believed to absorb the watery portions of the milk when first secreted, and it is to these vessels that we address ourselves when we endeavour to diminish the quantity of the milk by frictions. (Fig. 11.)

CHAPTER III.

THE INTERNAL ORGANS OF GENERATION.

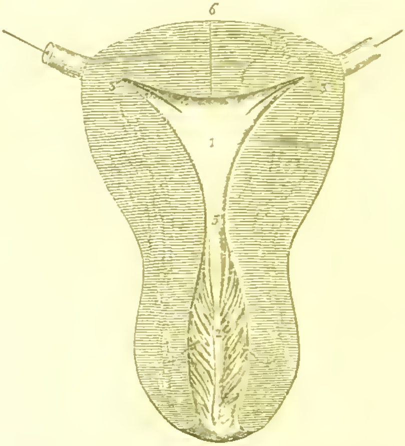
The Uterus is, in an obstetrical sense, by far the most important of all the organs of generation. It is in this visens that the ovum is received, retained, and nourished until the fœtus becomes fitted for extra-uterine existence, and to the physiological action of this organ, its expulsion at the end of utero-gestation is mainly due. The following description will have reference chiefly to the unimpregnated uterus.

In shape the Virgin or Nulliparous uterus is pyriform. Dubois describes it as a cone compressed from before backwards, and compares it to a flattened calabash, the base of which is directed upwards, and the orifice downwards. The uterus is placed in the middle of the upper part of the pelvis, its direction being the same as that of the pelvic inlet. It is situated above the vagina, and below the ilium, having the bladder in front, and the rectum behind it. Thus the inferior part of the uterus has a vaginal, and the upper part a peritoneal aspect. The lower part of the organ consists of the Os uteri, possessing an anterior and posterior lip, and constituting the outlet of the uterus as regards the catamenial secretion, and the products of impregnation; and its inlet, with respect to coïtus, and the fertilization of the ovum. Above the os uteri is situated the Cervix, and the highest part of the uterus is called the Fundus, the upper and middle portion being termed the Body. The cervix and body contain a canal and cavity, but the great bulk of the organ consists of its walls, which are of considerable thickness. The external surface of the uterus is in part covered by mucous membrane, and in part by peritoneum, the rest of its superficies being occupied by attachments to other organs. The uterus is from two and a half to two and three-quarters of an inch in length, its breadth being, from one Fallopian tube to another, about an inch and a half, or an inch and three-quarters. At the cervix the breadth of the uterus is about an inch. From before backwards its greatest diameter is about an inch, and the greatest thickness of its parietes, which is in the middle of the body, is about half an inch. The anterior surface of the uterus is somewhat flattened, the posterior being convex.

The os uteri is circular or somewhat oval in form, its transverse diameter being generally greater than the antero-posterior. Of the two lips of which it is composed, the anterior is the lower, so that it somewhat hides the posterior lip, as well as the orifice. The fissure itself is, in the nulliparous uterus, not circular, but transverse, the external angles of the rima being directed backwards, like the mouth of a fish. It is from this peculiarity that it derives its name of os tincæ.

The canal of the cervix is fusiform in shape. There is a slight constriction at the os uteri, and a more considerable narrowing of the canal at the os uteri internum, or the point at which the canal of the cervix enters the cavity of the body. The cervical canal is flattened from before backwards, and is about an inch and a half in length. It is lined by mucous membrane, which is arranged in a peculiar manner. When the cavity of a virgin cervix uteri is laid open, the internal surface is generally found to contain four columns of rugæ, arranged more or less in a transverse direction. The reduplications of the cervical mucous membrane may be compared to an open book, and the names, penniform rugæ, palmæ plicatæ, and arbor vitæ internus have been applied to them.

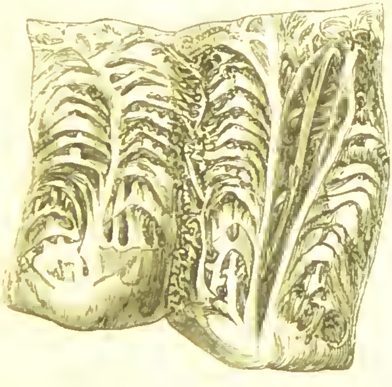
Fig. 12.



1. Cavity of the body. 2. Canal of cervix. 3. Opening of Fallopian tubes. 4. Penniform rugæ. 5. Os uteri internum. 6. Fundus.

These rugæ are separated by four grooves or sulci, two of which divide the anterior from the posterior walls; the other two, which are the most marked, being upon the median line in the anterior and posterior walls. There are from ten to fifteen rugæ in each column. These rugæ, and the spaces between them, are everywhere covered by such multitudes of mucous cysts or follicles, that on a moderate computation, under a power of eighteen diameters, at least ten thousand mucous follicles are visible in a well-developed nulliparous organ. The cervix uteri may in effect be considered as an open gland. The rugæ are evidently a provision for the dilatation of the mucous membrane in the latter months of pregnancy, and during parturition. They also provide an extensive secretory surface. (Fig. 13.) The objects of the secretion are to keep the cervix uteri impermeable to air, to provide a fit medium for the ascent of the spermatozoa, to furnish the plug which fills the cervix during pregnancy, and to secrete the mucus which lubricates the os uteri and vagina during labour. The secretion consists of mucous corpuscles and plasma, having a distinct alkaline reaction, while the secretion of the external portion of the os is decidedly acid. The limits of the acid and alkaline secretion are determined by the presence of squamous or cylindrical epithelium. Where the epithelium is cylindrical, the secretion is alkaline; where there is squamous epithelium, the mucous secretion becomes acid.

FIG. 13.



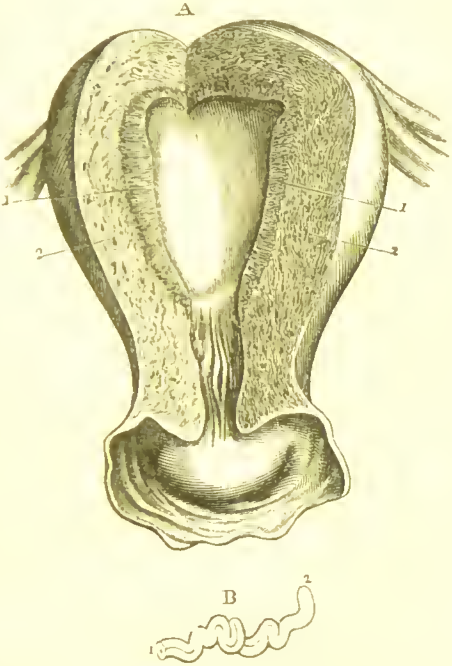
View of the canal of the cervix uteri laid open.

The cavity of the body of the nulliparous uterus is triangular in shape, the base of the triangle being above, and the apex below. At the two superior angles, the Fallopian tubes enter the uterus, while at the inferior angle the canal of the cervix communicates with the body of the organ. The angles leading to the Fallopian tubes are grooved; and at the middle of the triangular space, the anterior and posterior walls of the body of the uterus project internally. The thinnest part of the walls of the uterus is at the entrance of the Fallopian tubes; the thickest is at the middle part of the fundus, and the parietes of the body opposite the middle of its triangular cavity.

Perhaps the most remarkable structure of the uterus, or, indeed, of the whole body, is the mucous membrane which lines the cavity of its body. It is, in the healthy condition, pale in colour, about a line in depth, and forms a thin layer, one aspect of which is free, the other being closely united to the proper tissue of the walls of the uterus. If the surface of the unimpregnated womb be examined with a lens, numerous points are visible, which are openings of the glands of the mucous membrane. The openings are given by Kölliker as one-thirtieth of a line in diameter. These glands are tubular, and slightly coiled upon themselves, closely resembling the glands of Lieberkuhn in the intestine. Their general arrangement, and that of the connective tissue around them, is concentric, the open mouth of each gland being upon the surface of the mucous membrane, and its cæcal portion deeply seated in the attached surface. Sometimes the utricular glands are double, or two glands may open upon the mucous surface by the same outlet. These glands are supposed by some to secrete mucus. Dr. West, for instance, supports the view that in leucorrhœa much of the discharge is, in certain cases, derived from these glands. Some believe they secrete the menstrual fluid. Others affirm that they elaborate the material out of which the decidua reflexa is formed. The latter, which is the opinion of Prof. Goodsir, Dr. Sharpey, and Kölliker, is probably the correct one. (Fig. 14.)

The mucous surface of the uterus, as already mentioned, is covered by epithelium. In the cavity of the body this is cylindrical and ciliated. The cilia vibrate from below upwards, and probably assist the ascent of the spermatozoa. In the cervix, the cilia are not always present, and at the margin of the os, at the lowest part of the canal of the cervix, the cylindrical epithelium ceases, the whole of the vaginal aspect of the os and cervix being covered by squamous epithelium, similar to that of the vagina. Underneath the epithelium, club-shaped papillæ or villi are everywhere found. Each villus consists of one or two looped bloodvessels and a cellular envelope, the whole being covered by epithelium. These villi are larger within the os uteri than upon its external surface, but they are less numerous in the upper part of the cervical canal, and the cavity of the body. At the os uteri these papillæ appear to possess special sensation of a sexual character. It is also probable that they play a part as excitors of reflex and peristaltic action.

FIG. 14.

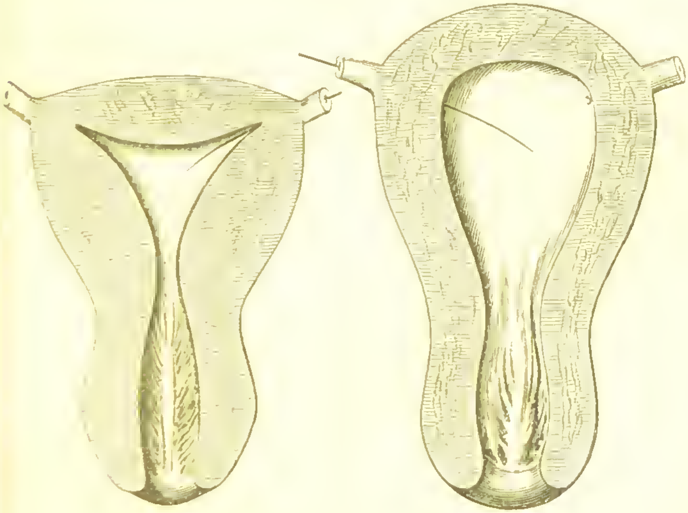


A. Uterus laid open. 1. Mucous membrane of uterus. 2. Substance of the uterine walls.
B. A single gland from the mucous membrane of the uterus. 1. Mouth of the gland. 2. Cæcal extremity.

According to the recent researches of Kölliker, Kilian, Mr. Rainey, and others, the substance of the uterus is made up of connective tissue and a vast number of fusiform fibre cells, fibre germs, or embryonic nucleated cells, having the power of development into non-striated involuntary muscular fibres. The diameter of these cells is about $\frac{1}{4000}$th of an inch, and their length is somewhat greater, so that they are slightly elongated in shape. In the unimpregnated uterus, under ordinary circumstances, the fibre cells or germs remain quiescent, and are not the subject of any increase in size. On the occurrence of impregnation, the growth of a polypus in the uterus, or any continued irritation of the cavity or walls, the embryonic fibre cells commence a career of growth and multiplication. These fibre cells are of great importance, as it is entirely to their development that the gravid uterus owes its contractile properties. They may be compared to the derivative germ cells by which lost parts are reproduced in the lower animals, and which, but for the loss which calls forth their development, would for ever remain inactive. In the case of the uterus, unless impregnation or some other stimulus be applied, these germ fibres remain through life in a rudimentary state. In the unimpregnated condition, it is probable that the germ fibres or fibre cells are in a more advanced state in some uteri than others, particularly in multipara. Cases are met with in which the uterus expels coagula, or the dysmenorrhœa membrane, by contractile efforts, even in the unimpregnated condition. It is probable, indeed certain, that, by relaxation of the fibre cells of the os and cervix, and contraction of those of the body, the os uteri may be opened and matters frequently expelled from the cavity of the virgin uterus.

The differences between the virgin or Nulliparous uterus, and the Multiparous organ, have been very strongly insisted upon by M. Paul Dubois. The term nulliparous uterus is evidently to be preferred to that of virgin uterus, as intercourse without impregnation exerts no influence upon the anatomical characters of the organ. In the multiparous uterus the anterior and posterior surface of the body is more rounded. The fundus, instead of being flat, is convex, so that there is a considerable protuberance above a line drawn from tube to tube. The vaginal portion of the neck is altered, being more conical and elongated. The os uteri, instead of presenting a transverse fissure, is rounded or puckered in shape. The depression felt by the finger is more evident, and the orifice is considerably larger. These changes in the os uteri are most evident in women who have borne large families. They are imitated to a slight extent in nulliparous women who have been subject to inflammatory conditions of the os uteri, dysmenorrhœa, polypus, or any of the conditions which excite the growth of the organ. The uterus which has been fully developed by gestation never returns, unless as a morbid condition, to the size of the nulliparous organ. Meckel gave the weight of the nulliparous organ at seven or eight drachms, and the multiparous at an ounce and a half. The diameters are all increased in the multiparous organ. (Fig. 15.) The interior of the uterus also offers some remarkable differences in the two organs. The cavity of the body of the multiparous womb is considerably enlarged. The os uteri internum is less distinct, and the canal of the cervix is shorter, the penniform rugæ being to some extent obliterated. The cavity of the body, instead of being distinctly triangular, is oval in shape, the angles into which the Fallopian tubes enter having entirely disappeared. (Fig. 16.) These changes are not without practical importance. Their consequence is obvious in a medico-legal point of view. A few years ago a lady of family

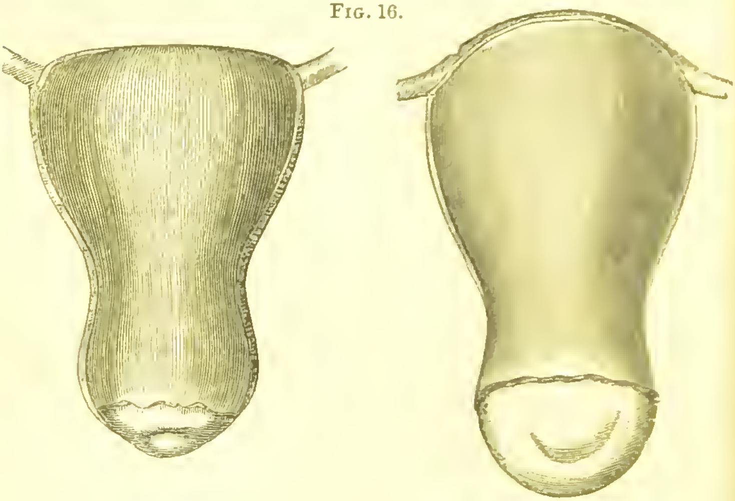
Fig. 15.



Sections of the nulliparous and multiparous uterus.

and her maid were burnt to death together in an hotel at the West-end. The bodies were so mutilated as to render any recognition by external signs impossible; but the lady had borne a numerous family, and the identity of her body was ascertained from the condition of the uterus. Again, in the return of the uterus to the unimpregnated state after parturition, the involution of the organ may be so excessive as to produce amenorrhœa and sterility, or, which is more frequent, it may be incomplete, and give rise to menorrhagia.

Fig. 16.



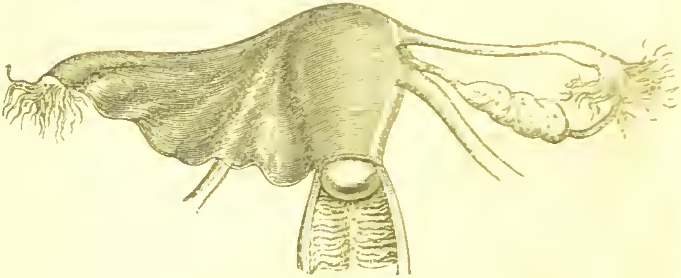
External views of the nulliparous and multiparous uterus.

The uterus is supplied with blood by four arteries, the two ovarian, or spermatic, and the two uterine. The upper part of the organ is supplied by the ovarian, and the lower by the proper uterine vessels. In the substance of the uterus they run a very tortuous course, anastomosing very frequently. The veins correspond to the arteries. Their walls are very thin in the uterus, and they possess no valves. They communicate with the veins of the bladder and vagina, and empty themselves into the iliac and ovarian veins. The lymphatics are numerous, but of small size before impregnation, and chiefly enter the lumbar glands. The uterus is principally supplied with nerves by the hypogastric and sacral nerves, and by branches from the ovarian plexus; but I propose to enter into the question of the nervous supply of the uterus when treating of the increase of the various tissues of the gravid uterus, and of the motor endowments of the parturient organ.

The Fallopian tubes extend on each side from the upper angles of the uterus towards the brim of the pelvis. Each tube is from four to five inches in length. The first direction is upwards and outwards; it then passes downwards, backwards, and inwards. The tubes can be felt as cord-like structures in the broad ligament, the uterine half being thicker than the external or ovarian portions. They are pervious throughout, the diameter of the canal being smallest at the uterine extremity. At the entrance to the uterus it, however, readily admits a fine whalebone stilette. At the distal extremity, or ostium abdominale, each tube terminates in the corpus fimbriatum—a fringe-like structure, which may be compared to the tentacles of a polyp. In the centre of the circular fringe is seated the ovarian aperture of the tube, considerably larger in size than the ostium uterinum. One of the fringes, or a separate ligamentous band, generally connects the Fallopian tube with the ovary, but the aperture and the general mass of the corpus fimbriatum floats loosely in the neighbourhood of the ovary. The internal surface of the tubes is lined by a mucous membrane, continuous with the mucous membrane of the uterus. It is thrown into longitudinal folds, so as to admit of dilatation, and is covered by ciliated cylindrical epithelium, the movements of the cilia being from the ovarian towards the uterine extremity. The mucous membrane of the tubes is thin, and devoid of villi or glands. The middle coat of the Fallopian tubes is continuous with the middle coat of the uterus, the fibres being more developed, and arranged as an external and longitudinal, and internal and circular layer, fitted for the vermicular or peristaltic movements which the tubes are called upon to perform. These layers are intermixed with connective tissue, similar to that found in the stroma of the ovary and the middle walls of the uterus. The external surface of the tubes consists of the peritoneal folds, constituting the ligamenta lata. (Fig. 17.)

As regards the function of the tubes, the ciliary currents and the muscular contractions combine to convey the impregnated or unimpregnated ovum from the ovarium to the uterine cavity. The tubes are really to be considered as the oviducts of the female economy. When they fail of their office in the impregnated condition, we have extra-uterine gestation as the result. There is scarcely anything more mysterious in the range of physiology than the grasping of the ovary by the fimbriated extremity of the tube when there is an impregnated ovum to be conveyed to the uterine cavity. At the time of impregnation there is not merely a grasping of the ovary, but the tube must be applied to precisely the spot upon the ovarium from which the ovulum is about to emerge. How is this selection to be accounted for? It is evidently one of those reflex actions in which the excitor and reflex stimuli are in such exact and exquisite relation as to simulate the most perfect effects of volition. Perhaps it is not more wonderful than what occurs in the case of the polyp. When a particle of food is placed on any part of the surface, the filaments of the oral fringes turn with precision to the foreign matter, and grasp it for conveyance to the interior of the animal. It appears either as though the different parts of the ovary were in exact relation with the corpus fimbriatum, or that when the ovarian stimulus has excited the fringes to contractions upon the ovarian surface, only that part of the ovary is firmly grasped which is in a state of irritation, such as that which attends the maturation or escape of an ovulum. During menstruation,

FIG. 17.

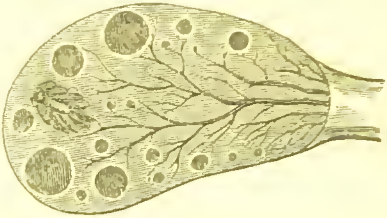


Relations of the unimpregnated uterus, vagina, ovaria, Fallopian tubes, and round ligaments.

the Fallopian tubes have been found firmly grasping the ovaria by Gendrin and other observers. The embrace of the ovaria is favoured by the turgescence and rigidity which the tubes assume under excitement, as observed by Cruikshank, and which directs them towards the ovaria.

The Ovaria are the analogues of the testes in the male, and constitute the dominant or prerogative organs of the female generative system. They are two flattened bodies, somewhat oval in form, or tending to a crescentic shape. Their length is considerably greater than their breadth, but the upper surface is slightly convex, and the lower somewhat concave. They are situated in the posterior fold of the broad ligament, and behind the Fallopian tubes. The ovaria are about half an inch thick, three-quarters of an inch wide, and from an inch to an inch and a half long. They are connected, as already mentioned, to the corpora fimbriata, and a ligament attaches them to the uterus, near the insertion of the Fallopian tube. This ligament, the Ligamentum Ovarii, connects the stroma or parenchyma of the ovarium, with the proper tissue of the uterus. These organs are entirely covered by peritoneum, except at the hilus, where the nerves and vessels enter, but are directly enveloped by a white fibrous tunic, the tunica albuginea, analogous to the membrane of the same name in the testis. The tunica albuginea encloses the proper structure, or stroma, of the ovary, which is reddish-white in colour, and similar in constitution to the proper fibrous structure of the uterus. Scattered about in the stroma of the ovary, but particularly towards the external surface, numerous small vesicles are found, varying in size from a pin's head to a small pea. These are the Graafian vesicles, or mucous follicles, as they should more properly be called. There are generally from ten to twenty, or more, in, or near, a state of maturity; but a far greater number of small vesicles are visible by the aid of the microscope, and are constantly maturing to replace those lost by the periodical rupture of the most advanced follicles. (Fig. 17.) The ovaria must be considered as two Follicular Glands. Each Graafian follicle represents the ultimate tubule, or follicle, of a secreting gland, lined with mucous membrane, from which it differs only in being closed on all occasions, except at the time when it discharges its contents. This tendency to the formation of closed vesicles or mucous follicles, extends to other parts of the generative system. It is met with in the Fallopian tubes, in the cavity of the body and cervix, at the os uteri, as in the case of the Nabothean follicles, and even in the vagina. The minute anatomy of the Graafian follicles will be given in a subsequent chapter, in connexion with the subjects of ovulation and menstruation. The ovary is supplied with blood by the spermatic and uterine arteries, which enter at the lower border, and after numerous divisions, take a serpentine course in the stroma, and are distributed to the tunica albuginea, the stroma, and the walls of the Graafian follicles. The veins follow the same course, and empty themselves into the uterine and internal spermatic veins. The lymphatics are few in number. The nerves are fibres derived from the renal and spermatic plexuses.

Fig. 18.



Section of human ovary, showing the formation of Graafian follicles. (About twice the natural size.)

The lower part of the uterus is attached to the bladder and rectum by folds of the peritoneum, which are sometimes called the Anterior and Posterior Uterine Ligaments. The peritoneum, reflected upwards, covers the anterior and posterior surfaces of the uterus, inclosing the organ between two layers of this membrane. These layers meet together at the sides of the uterus, and pass off to the lateral walls of the pelvic cavity, dividing the pelvis transversely. In this way, the peritoneum forms the principal part of the Broad Ligaments of the uterus. The fibrous or rudimentary muscular structure of the uterus itself also extends into these ligaments. They contain besides, the Fallopian tubes, the ovaria, the Round Ligaments, together with bloodvessels, nerves, and lymphatics. The round ligaments arise from the upper angles of the uterus, in front of the Fallopian tubes. From this origin, each ligament passes to the inguinal ring, descends the inguinal canal, turning round the epigastric artery, and its fibres are inserted into, or united with, the structures of the mons veneris. The length of the round ligament is from four to five inches. The external transverse fibres of the proper substance of the uterus are prolonged into the round ligaments, of which they form a constituent part. Some fibres of the internal oblique muscles also enter the lower part of the canals, and extending upwards, contribute to the formation of the ligaments. The ovaria have already been shown to be connected with the uterus, at the point of insertion of the Fallopian tubes, by a fibro-cellular cord or ligament, prolonged from the proper substance of the uterus. Thus the fibroid embryonic muscular tissue of the uterus is continued from below into the vagina, and above into he ovaria, Fallopian tubes, and the broad and round ligaments. This arrangement probably facilitates the great displacements of the vagina, tubes, ligaments, and ovaria, which occur physiologically during the growth of the gravid uterus. The growth of the muscular tissue in these several parts allows of their elongation and change of position without injury or rupture.

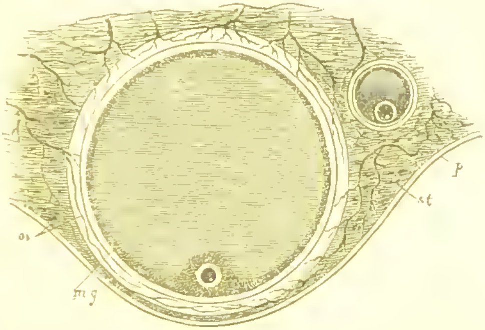
CHAPTER IV.

OVULATION.

THE mature Graafian follicle is about the size of a small pea. It is formed of two layers—one internal and fibro-cellular in structure; the other external and vascular, consisting of the condensed ovarian stroma. The external surface of the ripe vesicle is also covered by the indusium of the ovary. It is the internal membrane which forms the proper ovisac. The ovisac is lined by a granular layer of epithelium. Altogether, the envelope of the follicle may be considered as a mucous membrane, and the Graafian follicles constitute the mucous follicles of the Ovarian Glands. Graafian follicles appear in the ovary at or soon after birth, being at first small, and distributed throughout its structure; but they gradually increase in size, and at puberty the largest follicles are found upon the surface of the organ. From this time to the decline of the catamenia, a succession of Graafian follicles ripen and find their way to the surface of the ovarium, when they rupture and discharge their contents, chiefly at the catamenial periods.

Each follicle contains a clear fluid, similar to the serum of the blood, in which are granular particles and nuclei derived from the epithelial lining. When De Graaf, of Delft, in Holland, described, in 1673, the follicles, which have since borne his name, they were supposed to be the actual ova of mammalia, though anatomists were at a loss to account for the small size of the impregnated ova occasionally found in the uterus and Fallopian tubes, as compared with the ovarian vesicles themselves. But in 1827, Von Baer, of St. Petersburg, discovered the true ovule within the Graafian vesicle; and since that time, the relations of the ovule to the other contents of the ovisac have been carefully examined by many distinguished anatomists. I may here mention that, in speaking of the unimpregnated state, it will be more precise to use the word Ovule, or Ovulum, reserving the term Ovum for the ovule after the occurrence of fecundation. It may also be observed that a close analogy exists between the ova of all animals, so that observations made upon one class of animals have a general application, and the history of the human ovule has been made out partly by the study of the ovule in the human female, and partly by the light thrown on the subject by researches in comparative anatomy. At first, and while the Graafian follicle is imbedded in the ovary, the ovule is found in the centre of the vesicle. At this time, the semi-transparent and albuminous matter and granules contained in the follicle have the following arrangement:—The granules are accumulated in the form of a layer on the internal surface of the ovisac, so as in a great degree to resemble an epithelial lining. This layer has been termed the Membrana granulosa. Immediately surrounding the ovule, another granular layer is found, which has been called the Tunica Granulosa. Passing between these two layers are certain granular bands, constituting what are termed the Retinacula, which retain the ovum in its place. When the follicles mature and approach the ovarian surface, the ovules also rise towards the free surface of the follicles, as Dr. Martin Barry believed, by the contractions of those bands of the retinacula situated on the superficial aspect of the vesicle; while the membrana granulosa and tunica granulosa now become fused together in those portions near the surface of the ovisac. The ovule thus becomes imbedded in an aggregation of granules, which is named the Cumulus Proligerus, or proligerous disc. If each Graafian follicle were spread out, we might consider each particular ovule as lying pon the surface of a mucous membrane, and enveloped in an ccumulation of granular or epithelial matter. (Fig. 19.)

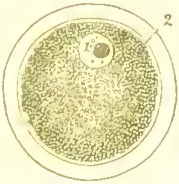
FIG. 19.



Section of two Graafian follicles, of different sizes. *p.* Peritonea covering. *s. t.* Ovarian stroma. *o. v.* The two layers of the ovisac. *m. g.* Membrana granulosa, or epithelial lining of the ovisac. Around the ovum this membrane is seen forming the proligerous disc. (Enlarged about eight diameters.)

Passing to the description of the ovule itself, it is found to easure about $\frac{1}{200}$th of an inch in diameter, and to consist of n external membrane, Zona Pellucida, or vitellary membrane, vitellus or yolk, and a Cell, which is termed the Germinal esicle or Germ Cell. (Fig. 20.)

FIG. 20.



Human ovule. 1. Germinal vesicle. 2. Yolk.

The vitellary membrane is the contain-g membrane of the yolk, and the yolk self differs considerably in different asses of animals. The yolk of the mam-iferous ovule is very small, as compared ith the yolk of birds and amphibia. In c mammalia, the yolk consists of ele-entary granules, all or nearly all of which e exhausted in the early germinal pro-sses of the ovum after impregnation has ken place; while in the ovipara, the lk is composed of two kinds of material, the one consisting granular particles, similar to those of the mammalian ovule, d termed the Germ Yolk; the other and larger portion, of t globules, intended for the nutrition of the ovum during cubation or early development, and termed, in contra-stinction to the former, the Food Yolk.

As regards size and position, the Germinal Vesicle bears much the same relation to the ovule, as the ovule does to the Graafian follicle. The germinal vesicle was first discovered in the ovule of the bird by Purkinje, of Breslau, in 1825, and when the mammalian ovule became known, the vesicle of Purkinje was soon sought for, and found by M. Coste. In man and mammalia, the germinal vesicle is about the one-sixtieth of a line in diameter.

Within the germinal vesicle or germ cell itself, is contained another important element of the reproductive process. In 1835, Rudolph Wagner, of Göttingen, and Mr. Wharton Jones in this country, discovered contemporaneously, a nucleus or collection of fine granules in the interior of the germinal vesicle, which has been called the Macula Germinativa, or germinal spot. In some animals the macula is nuclear in character, while in others the germinal spot consists of a mass of small granules. This addition to our knowledge of the ovule brought this germinal vesicle within the category of ordinary nucleated cells.

The Macula Germinativa is the nucleus or centre of the whole of this wonderful organism, and it may be useful to trace the anatomy of the mature Graafian follicle from within outwards. Surrounding the germinal spot, we have the germinal vesicle. On the outside of the germinal vesicle, there is the yolk, enclosed in the vitellary membrane. These structures, taken collectively, constitute the ovule. The ovule itself is contained within the Graafian follicle, but it does not remain in its centre, this being occupied by the liquor folliculi. The ovule is seated in a cumulus, or mamelon of granular epithelial matter, constituting the proligerous disc, and forming part of the lining membrane of the follicle. On the outside of this membrane there are the fibro-cellular and vascular layers of the follicle: and lastly, upon its free surface, the indusium, or ovarian portion of the peritoneum. (Fig. 21.)

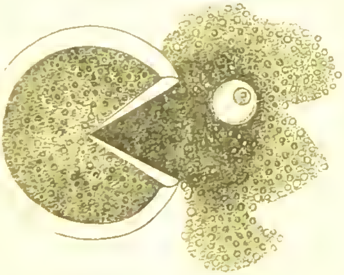
As the ovule is not at the surface of the Graafian follicle, so the germinal vesicle is near the superficial surface of the ovule, and the macula germinativa is near the cell in all of the germinal vesicles. Thus the germinal spot, altogether covered by the indusium, the membranes of the follicle, the zona pellucida, and cell-wall of the germinal vesicle, is in reality very near the external surface of the Graafian follicle.

When the Graafian follicle is ready to shed the ovule, it protrudes slightly above the surface of the ovary, and the upture of the follicle is apparently caused by an increase of he liquor folliculi, or fluid secreted by the epithelial lining of he ovisac. The gradual distension of the ollicle causes a thinning of its fibrous and ascular walls, and of the indusium, until at ength it bursts. The ovulum has at this time pproached the apex of the projecting part of he follicle, and is discharged with the liquor olliculi, surrounded by the granular matter onstituting the proligerous disc. (Fig. 22.) f the tube is applied to the ovary, the ovulum t once passes into the oviduct. At this step f the process, we may recognise the glandular structure and function of the ovary. When the peritoneum nd membranes of the ovisac are perforated, and the sugescent mbrace of the ovarium by the Fallopian tube occurs, the hannel from the uterus to the ovary is quite as unbroken s that from the bladder to the kidney. The ovisac is now e cæcal extremity of a glandular follicle, and the Fallopian ube is its excretory duct.

Fig. 21.

Germinal vesicle and macula germinativa.

Fig. 22.

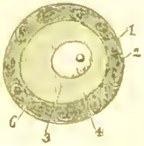


Ruptured Graafian follicle, with the escape of the ovule.

At this point, the question occurs as to the mode in which e ovule is formed in the Graafian follicle. The earliest conition in which the follicles are seen in the embryo is in the ape of a spherical mass of cells, containing the germinal esicle in its centre. From the external cellular mass is deveped the membranes of the follicles, its epithelial lining, and e vitellary membrane. It is a question whether the gerinal vesicle is formed or secreted by the cells forming the llicle, or whether its nucleus exists at the time the spherical arrangement of the cells takes place, the follicle being developed around the germinal vesicle and its nucleus. Some believe, with Huschke, that the ova are formed of acini, detached from the substance of the stroma of the ovary; others hold, with Dr. Martin Barry, that they are formed from the nuclei found in great numbers in the ovarian parenchyma. The latter seems most in accordance with the facts known respecting the origin of the ovary. According to this view, the germinal vesicles and their nuclei exist from the earliest formation of the ovary, and the follicles are developed around them for the purpose of maturing and sustaining the ovule, and finally of extruding it from the ovarium when it has become fitted for impregnation.

Whether we believe the ovules to be produced from the acini or nuclei of the ovarian parenchyma, we must compare the ovaria to glands, and consider the ovules and germ cells as their secretory products. In the early formation and development of all glands, a process takes place, once and for all, similar to that which occurs in the ovaria time after time in the maturation of individual follicles and ovules. The cæca and follicles of glands, and the epithelial lining from which the special glandular secretion continues to be produced as long as the gland remains active, are matured at the date of the original development of the gland. In the case of the ovaria, the developmental process, instead of being perfected at the time of their original formation, is continually going on during the reproductive era, and evolving new epithelial and germinal material. (Fig. 23.) In the analogous organs, the testes, the sperm cells which produce the spermatozoa, are still more distinctly the result of the secretory process in these glands.

Fig. 23.



Follicle from the ovary of a newly-born child. 1. Structureless membrane of follicle. 2. Epithelium, or membrana granulosa. 3. Yolk. 4. Germinal vesicle. 6. Vitellary membrane.

The comprehension of the mode in which the ovule escapes periodically from the Graafian follicle, was arrived at quite as slowly, and occupied as many observers, as the anatomy of the ovule itself. Harvey, in his day, drew a comparison between menstruation and the oviposition of birds. In 1672, Kerkringius advanced the idea that ova, at that time supposed to be identical with the follicles of De Graaf, were thrown off at the time of menstruation. The first positive opinion respecting the rupture of Graafian follicles, during menstruation, appears to have been due to Sir Everard Home. Cruikshank, in 1797, described the case of a woman who had died during menstruation, and in whom the external membranes of the ovary were ruptured at one point. He supposed that from this opening an ovum had escaped into the Fallopian tube. But these were isolated cases. The first body of facts bearing upon the matter was supplied by Dr. Robert Lee, whose first dissection was made in 1831. Dr. Power had, ten years previously, published his hypothesis respecting the periodical escape of the ovule at the catamenial periods. But, as we have seen, the discovery of the ovule, by Baer, was made in 1827. This discovery, which was not recognised by Dr. Lee, soon rendered the rupture of the Graafian follicle an intelligible fact, and the theory of Ovulation in the human female, and in the mammalia, has been completed by the researches of Pouchet, Negrier, Martin Barry, Gendrin, Raciborski, Coste, Bischoff, and others.

It may now, then, be considered as an established fact in physiology, that during perfect menstruation, or the rut or heat of animals, Graafian follicles are ruptured, and ovules discharged. In the human female, it is believed that in ordinary cases the ovule escapes towards, or shortly after, the termination of the menstrual flow, through the pore or fissure usually found in the peritoneal surface of the ovary. Sometimes an ovule escapes from each ovary, or more than one ovule may escape from the ovary of either side. The observations of Dr. Ritchie and others have shown that ova, probably of immature formation, may escape before the time of puberty, and occasionally Graafian follicles are ruptured in the intervals between the catamenial periods. In some cases, the excitement of the ovary during menstruation may not be sufficient to cause the perforation of the follicle so as to admit of the escape of the ovule. The ovule has been detected in the Fallopian tube in persons who have died during, or shortly after, menstruation, by Dr. Letheby, and also by Hyrtl. The time occupied in the descent of the ovule through the Fallopian tube and uterus is not known precisely, and can only be inferred from the number of days after menstruation at which conception may take place. It is evident that several days must elapse before it is discharged from the uterus. Indeed, in the case of virgin or infertile ovulation, it is uncertain, when fecundation does not take place, whether the ovule becomes decomposed, or is discharged externally. Before the advent of puberty, the surface of the ovary is smooth, and the organ comparatively full and large; but at each menstruation, one or more perforations occur, and the organ becomes, in process of time, scarred with numerous cicatrices; so that, in the aged female, it is shrunk and corrugated with the remains of the numerous follicles which have been ruptured during the whole of the child-bearing epoch.

Certain changes occur in the Graafian follicle, or ovisac, at, and subsequent to, the time of ovulation. These changes are more marked when impregnation has occurred, than in cases of virgin ovulation, and result in the formation of the Corpus Luteum. At the time of the escape of the ovule, there is a greater afflux of blood than usual to the membranes of the ovisac, a clot of blood is effused into its cavity, and, according to the views of M. Pouchet, the epithelial lining, or membrana granulosa, undergoes a remarkable development. This membrane becomes thickened by a cell-formation, the hypertrophied cellular layer being at first of a reddish colour, but afterwards becoming yellow. The yellow matter is arranged in the form of plicæ, which diverge from the cavity towards the circumference of the ovisac. The new formation is gradually thrown into folds, or corrugations, by the contraction of the ovisac, and becoming thicker as the development of the corpus luteum proceeds, its internal surfaces at length are brought into contact. In this way the stellate cicatrix found in the centre of the true corpus luteum is formed. (Fig. 24.) Before this apposition has occurred, the fibrinous clot has been decolorized, or converted into fluid, and in either case absorbed. The substance of the corpus luteum is soft, fleshy, and friable, and is permeated with numerous vessels from the external surface of the ovisac, so that the true corpus luteum admits of being injected from the vessels of the ovary. It should be said, that although little difference of opinion exists as to the appearances presented by the corpus luteum, numerous hypotheses have been advanced as to the mode in which the yellow layer, constituting its chief bulk, is formed. The latest evidence appears, however, to be in favour of its origin in the membrana granulosa. Dr. Lee contends that it is a deposit external to the lining membrane, and Mr. Wharton

Jones joins him in this opinion. Knox, Müller, and Dr. Dalton regard it as an hypertrophy of the outer membrane itself, while Kölliker considers it to depend partly upon enlargement of the epithelial lining, and partly upon that of the internal or fibro-cellular layer of the ovisac.

FIG. 24.

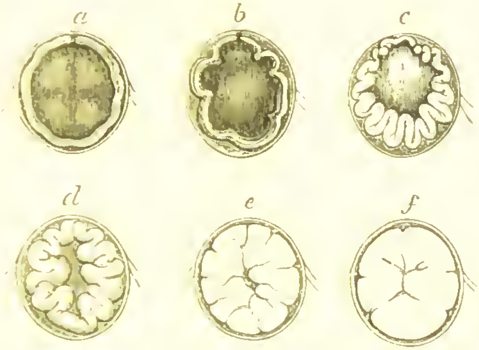
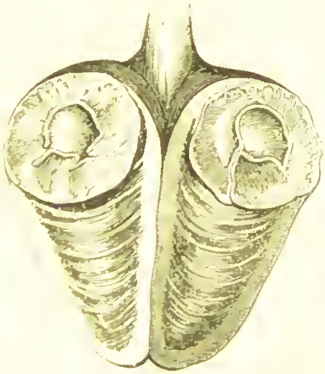


Diagram of the formation of the corpus luteum in a mammifer. *a*. The cavity of the follicle filled with blood. *b*, *c*. The clot diminishing in size, while the epithelial lining becomes thickened and convoluted. *d*, *e*, *f*. Completion of the process.

In size and shape, the true corpus luteum, that which follows upon impregnation, (fig. 25,) resembles a small bean, and projects from the surface of the ovary as a mamillary body, occupying from one-quarter to one-half of the entire superficies of the organ. It is largest in the early weeks of pregnancy, and after the third month, it slowly decreases in size until the time of parturition, when it rapidly retrogrades, and at length becomes a mere scar. Its cavity is obliterated, at a variable time, being found in some cases after labour. It is at first filled

FIG. 25.



Section of the human ovary, showing the Graafian vesicle at the third month of gestation.

with a clot, or serum, or the remains of the liquor folliculi, and the aperture through which the ovule has escaped sometimes remains pervious for a considerable time after impregnation.

Upon the escape of an ovule from a Graafian follicle in the virgin the changes described occur, but to a less extent than when impregnation has taken place, and a false corpus luteum is formed. The membranous layer is less considerable, and instead of being of a yellow tint, is of a dull-red colour. According to Dr. Dalton, who has carefully investigated this subject, it reaches its greatest development about three weeks after ovulation, and from this time rapidly disappears, leaving no vestige of its existence beyond a small scar. In the case of the virgin corpus luteum, other Graafian follicles are passing on to maturity, *pari passu* with its development, whereas in the true corpus luteum the occurrence of gestation suspends the maturation of ovules. As a general rule, the virgin corpus luteum is much smaller than the body formed after impregnation; but cases occur in which the spurious equals the true corpus luteum in size. The differences between the corpora lutea of the virgin and of the impregnated female show that in the case of the latter there is at the time of ovulation a greatly increased vascularity, and that during gestation the corpus luteum shares in the excitement incident to the gravid uterus. Other formations besides the corpora lutea of the nulliparous female have been mistaken for the true corpora lutea. Small tubercular masses are sometimes found having a certain resemblance to these bodies, and after the decline of the catamenia, the follicles which have not reached maturity during the era of child-bearing, collapse, and form cicatrices which have sometimes been thought to resemble the genuine corpora lutea.

During the periodical process of ovulation, there is a great determination of blood to the whole ovary. This has been observed in cases in which the ovaria of women who have died during menstruation have been examined. It has also been observed during life. Dr. Oldham had a most interesting case at Guy's hospital, in which the ovaria were situated in the inguinal rings, and could be readily examined by the finger. He found that at each catamenial period one or both of the ovaria became painful, and greatly increased in size; this increased size and sensibility lasted as long as the catamenial flow, and then diminished.

[illegible]
he Monthly period The Flowers. The Catamenia.
he Monthly Indisposition.

CHAPTER V.

MENSTRUATION.

ment Puberty generally viewed in connection with the
currence of Menstruation the relation generally
ists, but not infrequently we observe this function
ppear, either in a regular or irregular
anner before the other indications of puberty are
lly developed; & as frequently these
ications precede for a longer or shorter period, the estab-

During the whole of the childbearing era, women are the subjects of a sanguineous discharge every month, except during the times of pregnancy or lactation. The advent of this discharge is the chief external sign of the appearance of puberty, and it occurs in temperate latitudes at about the age of fourteen or fifteen. In former times, the most exaggerated notions were entertained respecting the influence of climate in determining the early or late appearance of the catamenia. It was supposed that towards the arctic circle the catamenia occurred only in mature womanhood, and were then frequently represented by a colourless discharge, or only appeared during the summer months; while it was believed that in the torrid zone, children of tender age menstruated and became wives and mothers. These views have been corrected by modern researches, and especially by the investigations of Mr. Roberton, of Manchester. The results of his inquiries, and those of other observers, show that the difference between the date of the first appearance of the catamenia in the Hindoo female, in whom the influence of heat of climate is strongly marked, and the natives of this country, is about two years; the average age at the first menstruation being about thirteen in Hindostan, and about fifteen in England. A table of the time of the first appearance of the menses in Labrador has been obtained by Mr. Roberton, and the mean age, at the first menstruation, is nearly sixteen. Probably this variation of three years between the Hindoo and the Esquimaux female, is amongst the greatest that can be obtained, as the result of climatorial influences, in different parts of the world. A variation of three years in the time of the commencement of a function, occurring between the ages of thirteen and sixteen, and lasting about thirty years, is, however, a very considerable one; and, while correcting old errors, we must be careful not to ignore the real effects of climate and temperature in hastening or retarding puberty. Dr. Tilt has made a very extended inquiry into this subject, and the results of his tables show that there is in fact an average difference of nearly three years between the date of

ment of the catamenial flux; much of this variability a
n the circumstances of modern society & education.
the period of menstruation the ovaries & uterus comply
ibit the state of growth with the rest of the economy.
now are more fully developed. During these changes

the whole frame & mental manifestations present greater activity of development; increased susceptibility & sensib of nervous system, mind acquires extended powers of emotio & passion, imagination becomes more lively; mammæ & pelvic viscera become rapidly developed, hips & thighs enlarge, ovaria become red & swollen, Fallopian tube

the first menstruation in hot and cold climates. Perhaps, if any criticism could be ventured upon respecting the valuable work of Mr. Roberton, and those writers who have adopted his views, it would be, that they have somewhat tended to make the influence of climate upon the functions of reproduction seem less than they are undoubtedly proved to be.

It is found that other agencies, besides those of climate, affect the age at which menstruation commences. The catamenia appear earlier in the children of the rich than of the poor. The influences of a large manufacturing town like Manchester also hasten the appearance of puberty. M. Brierre de Boismont ascertained that menstruation begins earlier in Paris than in the smaller towns of France, and in these again at an earlier age than in the wholly rural districts. Raciborski believes that race has an influence upon puberty, apart from climate—as, for instance, that the English child, reared in India, menstruates at the time she would have menstruated in this country; but that if a Hindoo child be brought to England, she will menstruate as early as though she had remained in Hindostan. It is also believed that Jewish females menstruate earlier in cold latitudes than the ordinary population. Probably climate, hygiene, temperament, and race, all exert an influence in promoting or retarding puberty, but within a narrower range than was formerly supposed. Cases are met with occasionally of children menstruating, and having sexual feeling, at a very early age; but these must be considered as irregularities, having but little bearing upon the function as ordinarily performed.

Table
11 — 10
12 — 16
13 — 53
14 — 85
15 — 97
16 — 95
17 — 57
18 — 26
19 27
20 — 8

The decline of menstruation, termed the Change of Life, or catamenial climacteric, generally occurs between the ages of forty-five and fifty; consequently, the catamenial era spreads over from thirty to thirty-five years. The time of the decline varies in different individuals; sometimes it occurs as early as thirty-five, or even before that age; at others it lasts up to sixty, or even beyond. Putting thirty years as the time during which a healthy female should have the menstrual periods, and supposing them to occur every four weeks, their number would be three hundred and ninety: 30 × 13 = 390. But in married and childbearing women, much of this time is occupied in gestation and lactation. During pregnancy, as the rule, the catamenia are absent, the cases in which a regular sanguineous discharge occurs during the whole of pregnancy being exceedingly rare. A discharge of blood for one or two

ith their fimbriæ are elongated, & erectile irritable, uterus acquired bul & a more sanguine hue, lungs, larynx & arms acquire contour f mature development. Intensity of vitality & resistance to urtful agents is such that mortality less at this than at ny other epoch.

uterine organs continue undeveloped menstrual discharge
s not appear, the growth of the body is impaired. appearance
healthy, languid blighted & imperfectly formed. Mind
ll, weak or depressed. Emotions & passions imperfect or
ent. vegetative functions less vigorous, fat & cellular substance
med instead of muscular tissue. Life is less intense & of

periods after the occurrence of impregnation is more common. The great majority of women do not menstruate during lactation, but menstruation during suckling is by no means so unusual as the occurrence of this function in pregnancy. Many women habitually menstruate as regularly during lactation as at other times. It has been remarked by some observers, that the intellect of woman does not reach maturity until after the final cessation of the catamenia; and it has been instanced as a sign of the superiority of the human race, that only a limited portion of the life of the female should be devoted to child-bearing.

It is necessary to possess exact ideas respecting the times of the occurrence of a periodical function like that of menstruation. The catamenia, or menses, as the names imply, are said to return once a month in ordinary cases. Some authorities speak of solar, others of lunar months, as the period observed by the catamenia. Strictly speaking, the Solar month—that is, the time occupied in the passing of the sun through one of the signs of the zodiac—is nearly thirty days and a half. The Lunar month, or the time between one new moon and another, is twenty-nine days and a half. The Calendar month varies from twenty-eight to thirty-one days. The Catamenial month is different from any of these, and consists of the common month of four weeks, or twenty-eight days, dating from the commencement of one period to the commencement of another. This is the ordinary periodicity observed by the catamenial function, or that which obtains in the great majority of women. Many females become unwell on the same day of the week for a long time, without any irregularity. In women who menstruate two or three days only, the interval between the cessation of one period and the beginning of another is longer, and in those who are many days unwell, shorter; but the length or brevity of the duration of the discharge does not usually affect the time of its return. In some women, the monthly periodicity is so continuous and exact, that the times between successive pregnancies, if reduced to days, are found to be multiples of twenty-eight. Cases are not uncommon, however, in which the catamenia return regularly at longer or shorter intervals than twenty-eight days, some women being unwell every six weeks, and others every two or every three weeks, but there is generally a tendency to observe some multiple of a week. In certain habits, a leucorrhœal discharge constantly occurs, and lasts

ter duration terminating in Phthisis.

It is of much importance to obtain satisfactory information a
the regularity & state of this evacuation in all cases in wh. the
health & disorders of females are concerned, & therefore the inquiri
of the physician should be careful & precise.

for three or four days, at the fortnightly interval between the regular periods. Although there is a very general tendency to regularity in the performance of this function, it is very common to find occasional variations to the extent of a few days.

Each "Period," as it is now common with educated women to call the monthly discharge, usually lasts in healthy subjects four or five days. Five days may be taken as the ordinary duration of the catamenial flow; but every woman has her constitutional peculiarity in this respect, some menstruating two or three days only, others always remaining unwell a week or more, such variations in women of different temperament and constitution being quite within the limits of health. The catamenial fluid consists chiefly of blood, modified to some extent by the ordinary utero-vaginal secretions, and other matters derived from the uterus and vagina. This is the result both of microscopical and chemical examination. The menstrual fluid has been examined with the microscope by MM. Donné and Pouchet, Dr. Hassall, and others. It has been found to consist of blood globules and the fluid parts of the blood, with mucus from the glands of the cervix, cylinder epithelium; granular matter from the cavity of the uterus, and scaly epithelium from the vagina. Dr. Whitehead has pointed out that the menstrual fluid as it escapes from the os uteri is alkaline, but that it becomes acid when mixed with the acid vaginal secretion, and this acidity, as formerly mentioned, tends to prevent its coagulation and decomposition in passing through the vagina. The menstrual fluid has been examined chemically by MM. Denis, Franz, Simon, Bouchardat, Rindskopf, and Dr. Letheby, and shown to consist chiefly of the elements of blood and mucus. An estimate of the amount of the discharge has been made by Dr. Meigs, who rates it at from four to six ounces at each period; but this can only be approximative in the case of a loss which, like the number of days through which it continues, varies in different individuals. It was long supposed that menstrual differed from ordinary blood, in the absence of fibrine in the former. It is now, however, understood that the cause of the non-coagulability of the catamenial fluid, and the apparent deficiency of fibrine, depend on the acid secretions of the vagina. When contraction of the os uteri exists, and the menstrual blood does not escape readily, it coagulates in utero, and is expelled with pain in the form of clots; or, if the fluid

When the health is good & discharge is regular & natural, all that i
required is avoidance of all influences, physical & moral wh. may pow
fully affect body or mind, Bloodletting, purgatives. Emetics hot or cold
baths foot bath. Cold or wet, fright, anger; exertion, long walki
dancing or riding. Vaginal injections.

is in quantity sufficient to neutralize the effects of the vaginal mucus, it coagulates after its escape externally. I use the terms "discharge," "loss," or "flow," in preference to that of secretion, because the catamenia appear to be essentially different from the products of any secretory process.

The influence of Menstruation, and the allied process of Ovulation, upon the female economy is very great. The beauty of form incident to womanhood; the marked characteristics of the female sex and the development of the affections, are intimately connected with, and dependent upon, the healthy appearance and performance of these periodical functions. The periods are commonly preceded by hypogastric and lumbar uneasiness or pain, tumidity of the breasts, a dark ppearance round the eyes, and a peculiar vaginal smell, especially adverted to by M. Pouchet, which has been termed the accine odour. There is also in many women a tendency to elaxation of the bowels for a day or two before the discharge ppears. Women are generally more hysterical and irritable t this than other times. These symptoms are all relieved by he healthy catamenial flow; personal appearance is improved, nd a new stimulus is imparted to all the organs of the body.

Thyroid gland, excitability
odour of perspiration
peculiar smell of breath
fastidious appetite.

The condition of the whole uterus is modified at the catamenial periods. The determination of blood to the organ enders it larger and darker in colour than it is at other times. t is firmer to the touch, and lower in the vagina than usual. The Fallopian tubes partake of the turgescence, and have een observed almost black from engorgement. In ordinary ases, the canal of the cervix and the os uteri are somewhat ilated at, and for a few days subsequent to, the menstrual ate. This renders it easier to introduce the uterine sound ust after the period than at any other time. In other cases here is a sphincteric contraction of the os uteri, similar to enesmus, which constitutes one of the forms of dysmenorhœa. For a short time after the flow there is a marked inrease of sexual feeling, and many women in whom the phrodisiac tendencies are moderate, possess little or no exitability at other times. The intention of this increased xual sensibility, at the time when the ovule is ready for pregnation, and the uterus to receive the products of fecunation, is sufficiently evident. It is at this time also, in those hose feelings are intense, and unbridled by the higher qualies of the mind, that aberrations in regard to sex, and tenncies to nymphomaniacal excitement, occur. It is indeed

rock remarks that either by accident or criminal impatience,
al intercourse has sometimes been permitted during menstru
, & although not constantly yet such conduct has been
quently followed by serious effects profuse hæmorrhage,
pression of discharge followed by fever delirium, obstinate
ria, Confirmed mania & even Catalepsy.

difficult to say, in many cases of this kind, how much should be attributed to disease, and how much to moral delinquency.

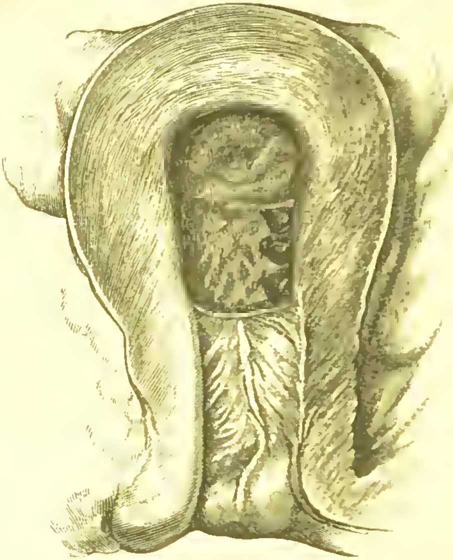
The cause of menstruation must be referred to the ovaria. These are the prerogative and ruling organs, a point insisted upon with great force and justice in the writings of MM. Pouchet and Chereau in France, and by Dr. Tilt in this country. It is found that in women with a proper development of the ovaria, breasts, and external organs of generation, and in whom the sexual feeling is strong, but in whom the uterus is congenitally deficient, a monthly nidus occurs, consisting of pain in the back, and other symptoms which indicate that ovulation occurs regularly, although no sanguineous discharge takes place. In these distressing cases, there is occasionally a show from the vulva, or an attack of epistaxis, or bleeding from some other part, at the periods of ovarian excitement, but nothing like the menstrual flow. On the other hand, in cases where the ovaria have been extirpated, menstruation is effectually arrested, although the uterus remains perfect. This happened in a case in which Mr. Pott removed the ovaries in an operation on a patient at St. Bartholomew's Hospital. Dr. Frederick Bird has also informed me, that in a case in which he removed both ovaria, in double ovarian disease, and where the patient recovered, permanent amenorrhœa was the result. We must look, then, to the ovaria for the exciting cause of menstruation, and this function is evidently subsidiary to that of ovulation.

Symptoms in some degree analogous to those of menstruation occur in the lower animals at the dates of ovulation. A comparison has been made between menstruation and the determination of blood to the comb of the domestic hen, the genitals of the pigeon and birds of the parrot tribe. In many of the lower mammalia, discharges from the genitalia take place at the time of the rut or heat, during or immediately after the occurrence of ovulation. In some of the quadrumana, sanguineous discharges have been observed; and it is believed that in the monkeys the œstrum has a monthly periodicity. Dr. Hille, a Dutch physician of Surinam, possessed a female monkey, which was the subject of a sanguineous discharge, lasting three or four days, every month. In others, as the Macacus libidinosus, the callosities near the anus, and the whole of the parts below the tail, become periodically of an intensely vivid red colour, and present an appearance, to use the words of M. Coste, of an immense nymosis. The phenomena of œstruation are more marked wild than in domesticated animals; and in those which only struate once a year, Mr. Roberton has pointed out that the ate of œstruation occurs at such a time as to admit of the mpletion of gestation and parturition in the spring season. ittle is known of the gestation of the quadrumana; but in e lower mammalia, the changes which occur in the lining embrane of the uterus, in æstruation and gestation, could not ell be the same as those belonging to the human female, cause in the lower animals that structure which answers to e decidua of the human female is a permanent organ.

Divers opinions have been held respecting the exact source the menstrual flow. It has been referred to the ovaria, e Fallopian tubes, the cavity of the body of the uterus, the and cervix uteri, and the vagina. Very recently, M. Ch. idee has published the result of three autopsies of women ho died near the menstrual period, in which he states that e mucous surface of the os was abraded, and he considers is a proof that the menstrual blood comes from the lips of e os uteri. I have no doubt these were really cases of abra- on, or ulceration, of the os uteri, and in such cases there is the menstrual period a discharge of blood from the diseased rface, as well as from the interior of the uterus. In such ses, the os uteri becomes, for a time, a menstrual ulcer, and e secretion of pus is converted into a discharge of blood. ll the exact evidence we possess points, however, to the vity of the body of the uterus as the true seat of men- ruation, and source of the discharge. The catamenia may ten be seen escaping from the os uteri, in examinations with e speculum. In cases of procidentia the whole process may watched, and in these cases the fluid always comes from ithin the uterus. In cases of inversion, we have a still more ositive proof, as the blood may be seen exuding from the rface of the inverted organ. The commencement of the ow at each period takes place very gradually. In examining tients, I have sometimes seen the first trace of the sangui- ous discharge at the os uteri, but it has been twelve hours more before it has appeared externally. The quantity of scharge being at first small, it passes down the vagina very owly. Probably the period ceases in the same gradual anner, and has disappeared from the os uteri some time fore the discharge is lost at the ostium vaginæ.

Within the last two years I have had opportunities of examining several uteri taken from women who had died during the catamenial flow. In each of them I found the mucous membrane of the body of the uterus either in a state of dissolution or entirely wanting. In one case, that of a woman previously in good health, who died suddenly from a fit of apoplexy while menstruating, and whose uterus was kindly sent to me by Mr. Filliter, of the Marylebone Infirmary, the mucous membrane was altogether gone. At the upper part of the cervix uteri the break in the mucous membrane was very apparent. In the cervical canal the mucous membrane was perfect; but at the os uteri internum, it ceased as abruptly as though it had been dissected away with a knife above this point. Blood was oozing at numerous points from broken vessels in the sub-mucous tissue. I had the assistance of Dr. Handfield Jones in examining this uterus with the microscope,

FIG. 26.



Uterus of a woman who died from apoplexy during the catamenial flow. The whole of the mucous membrane of the body of the uterus is wanting.

d we could find no traces of the epithelium or of the utri-
lar glands. The surface of the cavity of the body of the
rus was exactly similar to that which may be seen after
rtions, in which the decidua, or, in other words, the deve-
ed mucous membrane, has been discharged. The sub-
eous surface was a pulpy mass, in which epithelium, the
ls of vessels, broken tubes, blood globules, and mucous
puscles were all that could be distinguished. I compared
s uterus with that of a woman who had died after an abor-
n at the third month, and the appearances in the original
o cases were precisely similar. Dr. Vernon informs me
t he has recently met with the uterus of a woman who
d during the catamenial flow, in which the appearances
sely resembled those now described.

The state of the uterine mucous membrane during menstru-
on has occupied the attention of many other observers. It has
nerally been described as thicker and more swollen during
catamenia than at other times. It should be mentioned,
vever, that descriptions of the uterus a few days before or
er the menstrual flow can have little bearing upon this
ject, and it is a rare occurrence to get the uterus of a
man who has died in the middle of healthy menstruation.
safe conclusions can be drawn from the cases in which
men suffering from severe disease have a sanguineous dis-
rge from the uterus at the time of death. It is not very
common for women to be affected with a red-coloured dis-
rge at the time of death. Prof. Simpson, in 1846, in his
er on the expulsion of the entire mucous membrane in
ain cases of Dysmenorrhœa, drew a comparison between
inary menstruation and the process of digestion, in which
epithelial layer is shed and removed after every meal. M.
chet has supposed that a decidual membrane is formed
ing each catamenial period, and discharged in the shape of
albuminous plug ten or twelve days after the cessation of
flow. Kölliker states that the mucous membrane becomes
kened during menstruation, the blood escaping from the
tured superficial capillaries, and the epithelium of the cavity
the body is in great part thrown off; but he considers it as
ormal if the whole or part of the entire mucous membrane
uld be detached. Müller compares the change in the mu-
s membrane of the uterus during menstruation to moulting,
nded, perhaps, by the formation of a new epithelium. A

case recorded by Dr. Janser has been often quoted. It was that of a girl murdered four days after menstruation. He describes the mucous membrane as somewhat thickened, and easily lifted from the surface by the handle of the scalpel. It was composed of the utricular glands, arranged perpendicularly, side by side, and covered by cylinder epithelium. This observer concludes that during menstruation the mucous membrane of the uterus presents the same characters as in the early part of gestation. Such cases, however, really prove nothing with respect to the condition of the mucous membrane during the actual presence of menstruation. In an organ like the uterus, the most important changes may occur in the space of four or five days.

It appears to me to be in accordance with what I have observed in uteri examined during the menstrual period, the facts connected with membranous dysmenorrhœa, and the detachment of the decidua in abortion and parturition, to suppose that the mucous membrane is in great part or entirely, broken up and its *débris* discharged, during each menstruation. The blood is probably exuded during the breaking up of the mucous structure, and the duration of the menstrual period represents the time occupied in this periodical decadence and renewal of the mucous membrane of the body of the uterus. The new mucous membrane becomes converted into the decidua in the impregnated female. The explanation of the absence of sanguineous discharges in the lower animals is probably supplied by the fact, that no periodical destruction and renovation of the uterine mucous membrane occurs in the lower animals. The mucous structure, which acts the part of the decidua, in them remains permanent, and is not removed even after parturition.

In cases of membranous dysmenorrhœa, we have proof of the exfoliation of the mucous membrane in an entire form, or in detached pieces. This may occur every month for many years, a new mucous membrane being developed after each menstruation. After abortions and after parturition, we know that the old mucous membrane is thrown off, and a new one formed. According to the view I have stated, a new mucous membrane is formed every month as part of the process of preparation for the reception of a fecundated ovum; not that the aptitude for the reception and implantation of the ovum belongs only to the newly-formed mucous membrane, though it is probably greater at this time than at others. The mucous membrane may become the seat of the changes consequent

pon impregnation just before a menstrual period, and in cases
here menstruation is suspended. According to the view now
ated, the mucous membrane of the uterus becomes excremen-
tious every month, and is discharged from the cavity of the
erus in a state of disintegration. The uterus appears to gain
new mucous membrane, by a process similar to the repro-
uction of lost parts.

Such a doctrine may at first sight appear startling, but we
ave always had a similar condition, during the menstrual
eriod, under our eyes, in cases of vicarious menstruation. In
ese cases, an ulcer upon any part of the surface of the body
ay skin over, or assume healthy granulations, during the
tervals of menstruation, but on the occurrence of the period,
e newly-formed skin gives way, or the healthy granulations
ough, and blood exudes from the surface for several days;
ter which the ulcer heals, or puts on a healthy aspect, until
e approach of the next catamenial period. I have at the
esent time a patient with a menstrual ulcer upon the dorsum
the tongue, in whom the sore heals partially or entirely
tween the periods, but at the catamenial dates the surface
ves way, the sore becoming deepened, and exuding blood,
ile the catamenia are flowing. We have only to consider
milar phenomena as occurring to the mucous membrane of
e body of the uterus, and we have a reasonable explanation
the mode in which this peculiar function is performed, and
the source of the sanguineous discharge.

CHAPTER VI.

ONCEPTION, AND THE EARLY DEVELOPMENT OF THE OVUM.

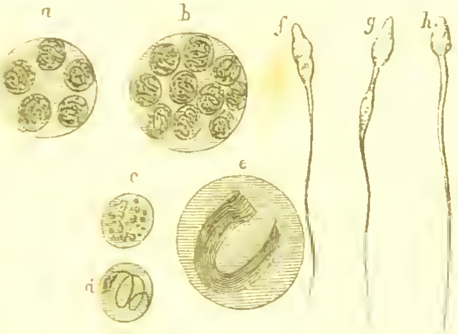
a former chapter, the anatomy of the Ovule has been traced
to the point of its fission or emission from the ovarium,
nsidering it chiefly with reference to ovulation and menstrua-
n in the unimpregnated state. It now becomes necessary
study it in relation to the act of fecundation, and the early
anges which occur in the impregnated condition. As the
ule approaches maturity, and makes its exit from the Graa-
n follicle, a remarkable change occurs in the germinal
sicle. It is believed by almost all observers, either to dis-

appear or to become entirely transformed. Dr. Martin Barry asserts that it does not disappear, but returns again to the centre of the ovule, where it becomes changed by a process of cell-development, which ends in the production of two cells in the centre of the yolk, from which cells the embryo is afterwards developed. It appears, also, from the later researches of Mr. Newport, that there is a partial return of the germinal vesicle towards the centre of the yolk, and that considering the germinal vesicle as a parent cell, its nuclear particles, which form the germinal spot, are developed into secondary cells; these again are transformed into cells of tertiary formation, and so on, until the germinal vesicle has been metamorphosed into a mass of cells, which leads to the rupture and diffluence of the walls of the parent cell, or germinal vesicle. From some one of these cells it is believed that a larger cell, the future Embryo-cell, occupying the site of the macula germinativa, and constituting the true Germinal point of the future Being, is developed. It is, however, as yet uncertain whether the embryo-cell, or vesicle, which replaces the germinal vesicle, is formed just before, or just after, the act of fecundation.

It is necessary in this place to glance briefly at the male element of impregnation. The part of the seminal fluid actually required for conception is the Spermatozoa. For a long time the spermatozoa were thought to be distinct animalcules, but they are now known to be particles *sui generis*, developed within the seminal cells found in the secretion of the testis before it leaves the gland. While they remain within the cells, these spermatic filaments are arranged in bundles, but in the passage of the fluid from the gland through the efferent apparatus, the cells rupture and set free the spermatozoa. Each spermatozoon consists of an oval and flattened body, and a filamentous portion, or tail. The width of the body is about $\frac{1}{6000}$th part of an inch, and the length of the entire particle is from $\frac{1}{400}$th to $\frac{1}{600}$th of an inch. Kölliker believes the spermatozoa to be allied to ciliated cells, and that they move in the fluid semen, or traverse the mucous membrane of the genital passages, by a succession of smart lashing movements. It has been proved by direct experiments—such as filtering the semen, and using the spermatozoa, and the pure liquor seminis, separately, in the impregnation of the ova of amphibia—that it is the spermatic particles and not the liquor seminis which form the real agents of fecundation.

Thus, then, on the part of the female, we have the ovule produced in the ovarium, the essential part of which is the germinal vesicle or germ cell. On the part of the male, we have the spermatic fluid, the essential part of which is the seminal vesicle, or sperm cell, produced in the testis. (Fig. 27.) The bundle of spermatic particles, or spermatozoa, formed in the sperm cell, correspond with the nuclear particles forming the macula germinativa, or germinal spot, of the germ cell. The spermatozoa may be considered, in fact, as the nuclear particles of the sperm cell. The bursting of the sperm cell and formation of the spermatozoa, on the one hand, and the development of the nuclear particles of the germ cell into the cellular mass which occupies the place of the germinal vesicle after its rupture, is the highest point of development to which the male and female elements can reach, if fecundation does not occur. It will be observed that several generations of cells have followed upon the germinal vesicle and its nucleus, before the ovule has been rendered ripe for impregnation; and the spermatozoa are also the secondary or tertiary products of the cells found in the secretion of the testis. The real origin, then, of the ovum is found in the union of the Sperm Cells and Germ Cells supplied by the male and female parents. There is no doubt, that both in the case of the sperm cells and the germ

FIG. 27.

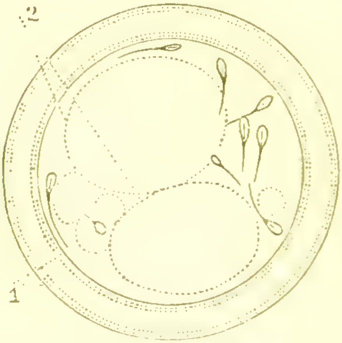


a, *b*. Sperm cells, containing nuclei, each nucleus having within it a spermatic filament. *c*. A nucleus, with nucleoli. *d*. Nucleus, with spermatic filament. *e*. A cell, with a bundle of spermatic filaments. *f*, *g*, *h*. Spermatic filaments.

cells, they must be looked upon as the result of a process of secretion in the testes and ovaria respectively.

We now approach the act of Fecundation or Impregnation, and recent researches have gone far to solve this, one of the most mysterious processes in the arcana of Nature. In the fecundation of the vegetable ovum, it has long been known that the moving spermatic particles of the pollen cell penetrate the ovum, and unite with the contents of the germ cell. Prevost and Dumas believed that the spermatozoa penetrated the ovum bodily, and became metamorphosed into parts of the animal embryo. In 1843, Dr. Martin Barry published, in the "Philosophical Transactions," an account of the actual penetration of the ovum of the rabbit by the spermatozoa, and he demonstrated the fact to the satisfaction of Dr. Sharpey, Mr. Owen, and Mr. Grainger. He believed that the spermatozoa penetrated the yolk, and there became divided into many parts. The following figure from Dr. Barry's paper represents the spermatozoa after they have entered the ovum. (Fig. 28.)

FIG. 28.



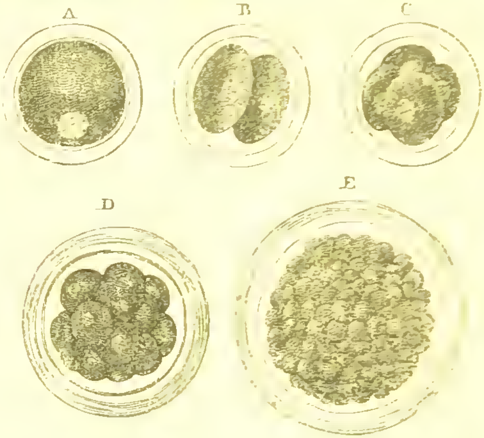
An ovum of the rabbit, taken from the Fallopian tube, twenty-four hours after leaving the ovary. 1. Zona pellucida. 2. The germ, consisting of two large cells. Several smaller cells, and numerous spermatozoa, are visible.

This view of Dr. Martin Barry was combated by many observers, particularly by Bischoff. Mr. Newport, in his first investigations into the impregnation of the ovule of the frog, published in 1851, did not agree with Dr. Barry. He believed that the moving spermatozoa approached the ovule, became applied to the surface, and disappeared in that situation by a process of diffluence or disintegration. He subsequently modified this opinion, and became convinced that the spermatic particles are imbedded in the walls of the ovule, and perforate the vitellary membrane in large numbers. Keber discovered that in the fresh-water mussel the spermatozoa pass into the interior of the ovum by a canal or opening in the walls of the ovum. The researches of Keber have been verified by

Dr. Martin Barry and Dr. Webb, of Lowestoft, and confirmed by Meissner and others. Müller has described a funnel-shaped canal in the ova of every species of Holothuria, having probably the same function as the canals discovered by Keber. Lastly, Dr. Nelson has investigated the reproduction of the *Ascaris mystax*, an entozoon found in the intestine of the cat, and demonstrated the penetration of the ovule by the spermatic particles in the clearest manner. These observations of Dr. Nelson have the high authority of Dr. Allen Thompson in their favour. It may be considered, then, as proved, that the spermatozoa penetrate the ovum, and come into positive contact and unite with the contents of the germ cell. Impregnation does not, however, depend on the penetration of the ovule by one spermatozoon, but by considerable numbers of spermatozoa. Mr. Newport found that the greater the number of spermatozoa in apposition with an ovule the more certain its fecundation became. Dr. Nelson observed that in the *Ascaris mystax* a sufficient number penetrated the chorion and vitellary membrane, to form a ring round the germinal vesicle. It is not by the influence of particle upon particle, but of mass upon mass, that the phenomena of impregnation appear to be accomplished. After the penetration of the ovule, the spermatozoa lose their motor power, become disintegrated or dissolved, and disappear; not, however, until they have communicated to the ovum that wonderful force which leads to the formation of the future being, but without which the ovule dies like any other simple animal cell.

The Ovule, having thus been converted into the Ovum, by the process of fecundation, we have now to speak of the earliest phenomena observed in the development of the new organization. The first change which is known to occur is the cleavage or segmentation of the yolk. The embryo cell first elongates, then becomes violin-shaped, and afterwards separates into two cells by spontaneous fission—an observation first made by Swammerdam. With this division of the embryo cell, the yolk divides into two masses, and the two cells are now in the centres of the two portions of the yolk. By a similar process, the two cells divide into four, and these again into eight, and so on, the yolk combining with the individual cells, until the process of segmentation is completed, and the product of the embryo cell and the yolk form together a homogeneous mass of cells, termed, from its endowments, the Germ-Mass, and which, from the appearance it presents, has been called by some authors the mulberry mass. In the formation of the germ-mass, the cells have evidently multiplied by the assimilation and conversion of the yolk. This germ-mass is the plastic material out of which the whole organization of the fœtus is gradually evolved. (Fig. 29.)

FIG. 29.



A. Ovum, with first embryo cell. B. Division of embryo cell, and cleavage of the yolk round it. C. Second division, or segmentation. D. Farther division. E. Germ mass or blastoderm forming.

Prof. Owen is of opinion that not all these germinal cells are consumed in the formation of the individual fabric, but that, in the mammalia for instance, a certain portion is reserved, and that this reserve becomes the ovarium or testis of the future animal. In the amphibia, and still lower in the scale, the remnants of the germinal cells not only go to form the sexual organs, but are located in different parts of the body, and become the agents in the reproduction of lost limbs or organs. This philosophical view of Mr. Owen is combated by Dr. Allen Thompson, one of the ablest embryologists in this country, on the ground that at an early period of development no difference can be seen between the blastema or commencing structure of the ovaria or testes and any other organ. Still the opinion of Mr. Owen upon this point cannot but carry great weight. It is probable that the blastema of all organs contain, in the first instance, germinal cells, which are gradually exhausted in the development of the tissues, but which in the ovaria and testes are reserved for the evolution of new individuals. If we believed, with Mr. Owen, that in each female a part of the residual germ-mass goes to the formation of the ovaria, and the evolution of germs in a new generation, we might infer that the human race is still almost in its infancy. The changes in these germ cells, occurring but once in every generation, if multiplied by the generations of men which have yet lived upon the earth, are infinitely less in number than the changes which occur in particular cells in the life-time of an individual. The epithelial cells of the digestive tube may be cited as an example, in which new progenies of cells are produced and destroyed after every ingestion of food.

After the formation of the germ-mass by the process of segmentation, those cells which are nearest the surface, and immediately under the zona pellucida or vitellary membrane, become aggregated together at one part of the ovum, so as to form a layer, which constitutes the Blastoderm, or Germinal Membrane. This membrane, in the first instance, divides into two layers—the external or Serous Layer, and the internal or Mucous Layer, for a knowledge of which division we are indebted to Pander, of Wurzburgh. Subsequently, other cells of the germ-mass collect between the serous and mucous layers, and arrange themselves into a third layer, which is termed the Vascular Layer. The serous layer gives origin to the Vertebral Column, the Brain and Spinal Marrow, the Extremities, and the general Skeleton. In the mucous layer arises the Mucous Membranes and the Glands; while in the vascular layer, the Heart and Vascular system originate. In forming a proper idea of these layers, the student must bear in mind that they are not flat layers, but are three spherical membranes contained within the external membrane of the ovum—that is, the vitellary membrane, or zona pellucida. On one aspect of the sphere, these membranes become thickened by the accumulation of cells, and in this thickened portion of the membrane the rudiments of the fœtus are formed. Attention must now be given to this thickened part of the several layers, and the student should consider himself as looking at a circumscribed portion of their spherical surfaces. The dense area referred to, constitutes the Area Germinativa (Fig. 30), which is first round, then oval, and subsequently pyriform in shape. In the centre of the area germinativa, the cells of the serous and mucous layers become fewer in number, so as to

FIG. 30.

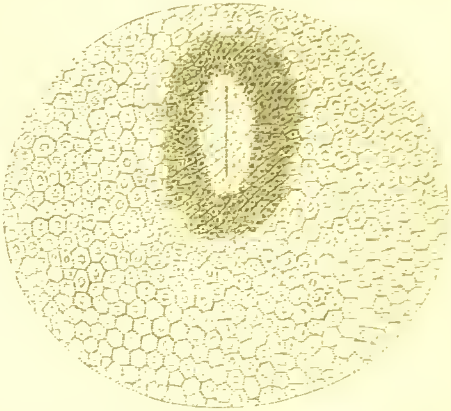


Diagram of area germinativa. In the centre, the primitive trace. Immediately surrounding it is the area pellucida, bounded by the dark area vasculosa.

render them comparatively transparent, thus forming a space called the Area Pellucida. Around this pellucid space a boundary is formed by an accumulation of cells in the vascular layer, and this circle is called the Area Vasculosa. In the centre of the area pellucida, and in the serous lamina, the first sign of the fœtus appears in the form of a transparent groove. This groove, which is the Primitive Trace, is surrounded by two elevated ridges, called the Laminæ Dorsales. (Fig. 31.) The primitive trace may be said to represent the future cerebro-spinal nervous centres, the dorsal laminæ, the cranium, and vertebral column. The ridges or elevations of the serous layer, constituting the laminæ dorsales, approach each other as the process of development goes on, and unite above, in this way closing over the groove already described. (Fig. 32.) Thus the vertebral canal is formed by the fusion of two processes of the serous layer at their apices. This method of forming separate cavities, from the layers out of which the fœtus originates, deserves special attention and study, as it is repeated again and again as the development of the ovum proceeds.

While the upper portions of the dorsal laminæ are thus closing over to form the vertebral canal, the under portions, which constitute the Laminæ Ventrales of Baer, elongate to form the ribs and abdominal walls, and they have the same tendency to meet and unite in the medial line. In this way the abdominal and thoracic cavities are formed, and the mesial raphe indicates in after life the place of union. Thus the vertebral and cranial cavities, and the cavities of the thorax, abdomen, and pelvis, all lined with serous membranes, are inclosures separated off from the general cavity of the primordial serous layer of the ovum. The limbs, with the joints and their fibro-serous linings, are also derived from the same membrane, and possibly the remarkable sympathies of the joints with the larger fibro-serous membranes in disease, as in articular Rheumatism and Pericarditis, may be referred to their common origin. It is easy to understand, that if the closing in of the spinal canal by the laminæ dorsales should be incomplete, we have spina bifida or hernia cerebri as the result; or that, if the lower laminæ do not meet in the median line, we have cleft palate, hare lip, deficiency in the walls of the thorax and abdomen, and other malformations depending on insufficient development at this early period. At this epoch of development it is, that various monstrosities, arising out of the union of twin fœtuses, occur. If two impregnated ova join anteriorly, before the closing in of the abdominal and thoracic

FIG. 31.

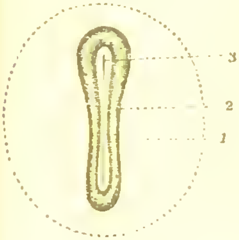


FIG. 32.

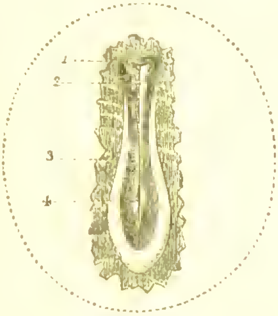


FIG. 31.—1. Area pellucida. 2. Laminæ dorsales. 3. Primitive trace or groove

FIG. 32.—1, 2, 3. Commencement of cerebrum, cerebellum, and Spinal marrow. 4. Commencement of vertebral column.

cavities, or posteriorly before the arching in of the vertebral and cranial canals, we may have an abdominal or spinal canal common to both. It is upon this principle, applied to the serous, vascular, and mucous layers, that all the varieties of double monster are to be explained. In the case of the African twin, recently exhibited in this country, the junction was at the sacral bones, and the ova must have united together at the sacrum, before the arching in of the sacral portion of the vertebral canals, so that the posterior aspects of the two sacral bones became fused together, the vertebral column being separate at every other point.

In the vascular layer, and in that part of it which has been referred to as the area vasculosa, surrounding the area pellucida, the first blood-channels are formed, by the unions of files of cells, and the obliteration of the cell-walls at the points of union; the first blood discs being formed, according to Dr. Carpenter, from the nuclei of the cells which have united to form the vessels. These vessels increase and enlarge, and are destined at first to carry to the embryo the nutriment absorbed from the yolk and from the chorion, the formation of which will hereafter be adverted to. The heart is formed in the same manner as the first bloodvessels, from cells, and retains for some time its cellular character. The vessels are, however, first formed, and the flow of the earliest blood globules is not from, but towards, the Punctum Saliens, or commencing heart. From this beginning, the circulating apparatus is gradually developed, passing through the phases which are permanent in fishes and amphibia, to reach, at the time of birth, the mammalian type.

Early in the formation of the embryo, the Amnion—the envelope belonging essentially to the ovum—begins to appear. It is formed in the following manner:—Beyond the two extremities of the ovum, and on the outside of the area pellucida, the serous lamina projects in the form of two hollow processes, which gradually arch over the whole of the fœtus, so that the dorsal aspect of the embryo is entirely covered by two layers of the serous lamina. (Figs. 33, 34.) These processes meet in the centre, and unite together. At first the processes are, at their origin, separated to a considerable extent on the ventral surface of the embryo, but they gradually approach each other at the umbilicus, and ultimately surround the elements forming the umbilical cord. Of the two layers of which the amnion is formed, one surrounds the embryo, and constitutes its proper envelope; the other becomes adherent to the external or maternal membranes. The cavity of the amnion

FIG. 33.

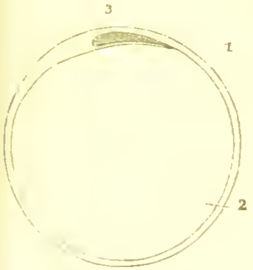


FIG. 34.

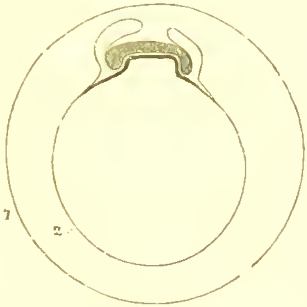


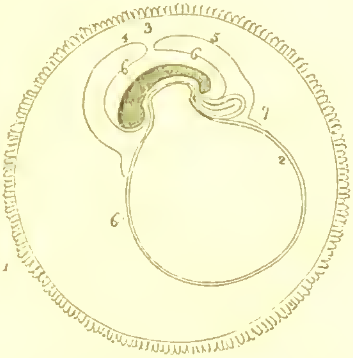
FIG. 33.—Diagram of early ovum. 1. Serous lamina. 2. The yolk. 3. Embryo.

FIG. 34.—Diagram showing the commencement of the amnion. 1. Chorion. 2. Yolk sac. Two folds of serous membrane are rising at the extremities of the embryo, to form the amnion.

becomes filled with a watery secretion, and the embryo is thus suspended in a fluid medium, which affords many advantages during the progress of utero-gestation. From the time when the amnion is first formed, to the date of parturition, this membrane and the bulk of the fluid it contains continue to increase. The outward pressure of the amniotic fluid seems to be the chief agent in promoting the extension of the external membranes of the ovum. It is worthy of remark that the secretion of a large quantity of fluid by a serous membrane, which secretion is closely allied to the dropsies of the serous cavities, should in the ovum be a purely physiological process. Sometimes the amniotic fluid is in excess when we have what is termed dropsy of the amnion. It will not be forgotten that the amnion, like the serous lining of the vertebral and cranial cavities, and the serous membranes of the chest and abdomen, is developed from the serous layer of the early ovum; and these membranes also, like the amnion, have in the fœtal state a tendency to excessive secretion, leading to congenital hydrocephalus and ascites. We may perhaps find an explanation of the sympathies between the skin and the serous membranes, as in the production of peritonitis or pleuritis by the influence of cold upon the skin, in their common origin from the serous or cutaneous layer of the ovum. The amnion is a reflexion from that part of the layer which forms the skin, and at birth the skin and amnion are continuous at the umbilicus, the amnion being reflected on the umbilical cord so as to form its external covering. The subject of the evolution of the perfect individual from a triple membranous sac would admit of an extensive development in human physiology and pathology. Man in his greatest pride does but consist of the multitudinous involutions and devolutions of these delicate membranes. Upon the vital energy possessed by these primordial layers depends his health, his tendencies to the diseases of the several systems evolved from them, and the duration of his existence.

The mucous layer has been described as the most internal of the membranous layers within the vitellary membrane. It is therefore in immediate contact with the central portion of the yolk, or that part of the mulberry mass not consumed in the formation of the three primary layers themselves. The first beginning of the mucous canals is formed by a constriction of the mucous layer on the under surface of the commencing fœtus. The constriction is formed by two processes of the mucous layer, which gradually approach each other. This constriction increases, until the smaller mucous cavity, from which the mucous membranes and glands are developed by a process of reduplication, is nearly cut off from the larger mucous cavity, which contains the remains of the germ-cells. This larger cavity it is which constitutes the Umbilical Vesicle, and the point of division between the two cavities subsequently becomes the umbilicus. It is from the umbilical vesicle that the embryo at this early period derives the greater part of its nutriment. At this time, the umbilical vesicle is continuous with the abdominal mucous cavity, by means of the vitelline duct at the umbilicus, the material of the yolk being conveyed to the embryo, not only by the duct, but by means of vessels developed in the part of the mucous layer composing the walls of the umbilical vesicle, and which vessels are called the vasa omphalo-meseraica. The omphalo-meseraic vessels consist of an artery and vein, which extend from the umbilical vesicle to the superior mesenteric artery and vein, in which they terminate. This state of things continues until the whole of the residuary material of the yolk has been converted to the uses of the embryo, when the umbilical vesicle, with the omphalo-mesenteric vessels, shrink up, and their remains constitute the Vesicula Alba, the white spot frequently seen, with great distinctness, in the abortion of early ova. (Fig. 35.)

Fig. 35.



1. The chorion. 2. Yolk mass and commencing umbilical vesicle. 3. Embryo. 4, 5, 6. Folds of serous layer forming amnion. 7. Commencement of allantois.

The Allantois is another temporary structure, which, with its mode of origin, it is necessary to describe. It is formed at the lower and anterior part of the embryo, not apparently from any reduplication of either of the primary layers, but from a mass of cells, in the same way as the heart and bloodvessels are formed. The cellular cavity is at first elongated in shape, but by the usual process of constriction it becomes divided into two, a larger and a smaller portion, communicating with each other, and of which the smaller is the urinary bladder. The urachus—the cord leading from the bladder to the umbilicus—is the remains of the duct which originally connected the bladder and the allantois. The allantois is partly intended as an excrementitious organ, receiving the earliest secretion of the kidneys, but chiefly, in the mammiferous ovum, as a means of conveying a loop of the bloodvessels of the embryo to the maternal surface of the ovum, and thus providing the permanent fœtal provisions for nutrition and excrementation. This will be again adverted to, when describing the maternal portions of the membranes of the ovum.

CHAPTER VII.

THE DECIDUA, CHORION, PLACENTA, AND UMBILICAL CORD.

While the changes which have been described in the previous chapter as the results of fecundation are proceeding in the embryo, other phenomena, equally necessary to the development of the ovum, are occurring in the uterus. The formation of the Amnion on the part of the embryo has been already referred to, and there remain for consideration two other membranes, the Decidua and Chorion, both of which are formed on the side of the mother; and also the Placenta, which is developed from the bloodvessels of the fœtus, and from certain portions of the chorion and decidua. The clearest information respecting these structures will probably be conveyed by some account of the mode in which they are developed.

On the occurrence of impregnation, a remarkable stimulus is imparted to the uterus, before the ovum has entered this organ, and certain changes are produced which fit it for the reception and retention of the embryo. The Membrana Decidua, so called from its destruction at the time of parturition, is entirely the production of the uterus, and has been the subject of many discussions since the time of its first accurate description by William Hunter. In the early part of pregnancy, the decidua consists of two principal portions, the Decidua Vera, lining the cavity of the uterus, and the Decidua Reflexa, which immediately surrounds the embryo. At this time, owing to the small size of the ovum, as compared with the cavity of the uterus, these two portions are in contact only at the point where the ovum rests upon the uterus, this being generally at the upper part of the cavity of the fundus, near the opening of one of the Fallopian tubes. Up to a comparatively recent period, the opinion which chiefly prevailed respecting the formation of the decidua was, that, immediately after fecundation, the uterus developed upon its internal surface a membranous sac, constituting the decidua vera, and that the ovum, descending the Fallopian tube, entered the uterus by pushing before it a reflexion of this new membrane. It was supposed that the fold originating in this away enveloped the embryo, and constituted the decidua reflexa. The ovum thus appeared to become involved in a duplicate membrane, which has often been compared to the double envelope of the heart formed by the reflexion of the pericardium. Dr. Sharpey was the first to call into question he common belief respecting the nature and formation of the decidua, and his investigations led him to the conclusion that he decidua vera was not a membrane formed upon the uterine mucous surface, but that it consisted of the actual mucous membrane of the uterus itself, altered by a process of development, under the stimulus of impregnation. Dr. Sharpey was followed by Prof. E. H. Weber and others, whose researches have all tended to confirm this view, and we now possess a large body of facts, which appear satisfactorily to explain the origin of the decidua vera and reflexa, and the relation of the decidua to the chorion and to the formation of the placenta.

The earliest changes which occur in the cavity of the uterus, after the impregnation of the ovule, consist of a swelling of the tubular glands of the mucous membrane, and of the capillary vessels distributed in the interspaces between these glands. (Fig. 36.) In the uterus examined a short time after the occurrence of fecundation, the glands are distinctly visible to the naked eye. Their length at this time is from one and a half to two Paris lines. The tubes become lined with epithelium of a whitish colour, and a profuse secretion of celloid particles and albuminous matter takes place from the surface of the mucous membrane in the inter-follicular spaces. (Fig. 37.)

This cellular secretion is so profuse that it not only forms a layer upon the surface, but a considerable quantity is poured into the cavity of the uterus. The enlargement of the tubular glands already referred to, and of the capillaries of the interglandular spaces, together with the plastic secretion poured out upon them—in other words, the altered mucous membrane of the uterus—constitute the Decidua Vera. With respect to the mode in which the decidua reflexa is formed, the latest views are those of Prof. Goodsir and M. Coste. Mr. Goodsir, in his paper "On the Structure of the Human Placenta," published in 1845, explained the formation of the decidua in the following manner:—He considered the celloid matter secreted from the uterine follicles and the inter-follicular spaces to belong to what he terms the third order of secretions—that is, cells having the power of accomplishing further changes, and of developing other cells from their nuclei, after they have left the mucous membrane which originally produced them. The minute ovum, on entering the uterus, becomes, according to Mr. Goodsir, imbedded in the cellular matter of the cavity of the uterus, which combines with its outer envelope the chorion, hereafter to be described, and ultimately forms the decidua reflexa. The decidua vera, then —in the opinion of Mr. Goodsir—consists of the uterine mucous membrane, altered in the manner described; while the decidua reflexa is a membranous, or plastic structure, formed out of the cellular secretion derived from the mucous

Fig. 36.

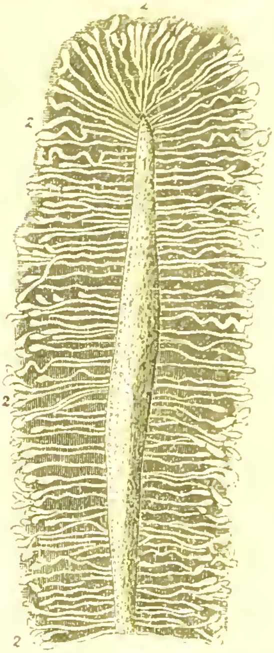


Fig. 37.

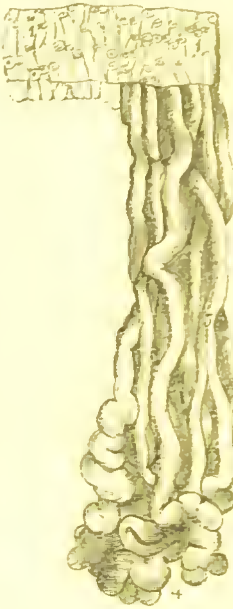


Fig. 36.—Section of the lining membrane of the uterus at the beginning of pregnancy, twice the natural size. 1. Opening of the glands on the surface of the cavity. 2. The utricular glands.

Fig. 37.—A portion of glandular structure, several times magnified. 1, 1. Orifices of the glands. 4. Cæcal extremities of glands. 5. Tubular portion of glands.

urface, or decidua vera. According to the views of M. Coste, published two years later, the decidua vera, and decidua reflexa, are both produced directly by the metamorphosis of the mucous membrane of the uterus itself. He believes that the vum, on entering the uterus, is imbedded in the soft and turgid mucous membrane, which becomes specially increased in thickness at the point which receives the ovum, and rising around it, like the florid granulations of an issue around a pea, ultimately meets, and is united, so as entirely to surround he ovum. (Figs. 38, 39.) This view of M. Coste was founded

FIG. 38.

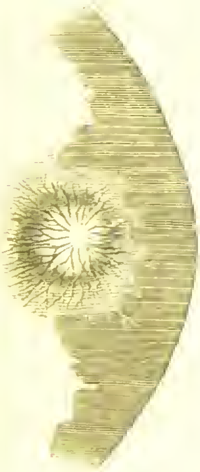


FIG. 39.

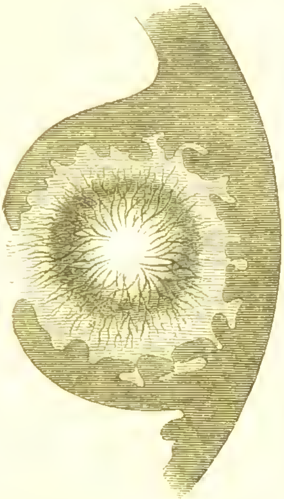


FIG. 38.—First stage of the formation of decidua reflexa.
FIG. 39.—More advanced stage of decidua reflexa.

pon the dissection of two uteri at the twentieth and twenty-fifth days after fecundation. The difference between the pinions of M. Coste and Mr. Goodsir is, that the one considers the decidua reflexa to be formed directly from the decidua vera, while the other believes it to be produced indirectly from a plastic layer exuded upon the surface of the decidua era.

When first formed, the decidua reflexa appears to differ from the decidua vera in being composed chiefly of cells, while the decidua vera is characterized by the presence of the tubular glands of the uterus. The portion of the cavity of the uterus—or, rather, of the cavity of the decidua—not occupied by the ovum, contains a fluid secretion, exuded from the hypertrophied mucous membrane, or decidua vera, of an albuminous character, which, in the early part of gestation, ministers to the nourishment of the ovum. This is the hydroperione of Breschet. Dr. Robert Lee believes that blood passes through minute openings in the decidua reflexa from the placental cells and the cells of the chorion, to be taken back into the maternal vascular system, through openings on the internal surface of the decidua vera, without being followed by the escape of blood externally. The internal surface of the decidua vera is smooth, but the external surface, or that in contact with the fibrous structure of the uterus, has been examined and described by Dr. Montgomery, who found it to consist of a number of cup-like elevations, or little bags, containing a whitish fluid, and which present open mouths on the side of the uterus. Dr. Montgomery terms these processes uterine cotyledons. They are best seen at the second or third months, and disappear with advancing pregnancy. Possibly these appearances may be the utricular glands of more recent observers. In cases of double uterus, in which only one is impregnated, a decidual membrane is sometimes found in the empty cavity; and it is generally, though not always, found in the uterus in cases of extra-uterine gestation. Considerable difference of opinion obtains as to whether the decidua lines the Fallopian tubes or not, but the weight of authority is against its doing so. The decidua vera increases with the development of the uterus, but after the adhesion of the ovum to the site of the future placenta, its chief development is at this part, and the Decidua Serotina, as the portion of the decidua vera entering into the formation of the placenta is called, becomes the most important part of the decidual membranes. The rest of the decidua vera becomes a comparatively thin layer, lining the whole surface of the uterus, except at the cervix uteri and the angles at which the Fallopian tubes enter the cavity of the fundus. In the early months, the space between the decidua vera and decidua reflexa forms a cavity which has been already referred to, and which is called the decidual cavity. As the uterus is, up to a late period of pregnancy, considerably larger than the contained ovum, the cavity between the decidual membranes continues to exist beyond the middle of gestation. In cases of doubtful pregnancy, or where pregnancy has not been suspected, the uterine sound has been passed into the uterus nearly to the fundus without inducing labour or causing hæmorrhage. The instrument, of course, passes in these cases through the mucous plug of the os uteri into the decidual cavity without producing any laceration. I have known a case in which the walls of the uterus and abdomen were so thin that the limbs of the child could be felt with great distinctness, and extra-uterine pregnancy was suspected. One ground for this diagnosis was that the sound had been repeatedly passed into the uterus without causing mischief. Of course, it would be wrong, in any case in which intra-uterine pregnancy was suspected, to pass an instrument into the decidual cavity, as there would be great risk of detaching the placenta. The external surface of the decidua reflexa and the internal surface of the decidua vera gradually become so smooth that they have been compared to serous membranes. In the latter months, the ovum entirely fills the uterus, so that the whole aspect of the decidual surfaces is brought into contact, and it is often difficult to divide the two, in the attempt to induce premature labour by separating the membranes from the cervix uteri. At the time of parturition, the amnion, chorion, and decidua reflexa are expelled with the placenta; but the decidua vera is subsequently broken down, and escapes, in the form of detritus, with the lochial discharge.

The other envelope which the fœtus derives from the mother, is the Chorion, which is internal to the decidua, and is formed before the ovum enters the uterus. When the ovule escapes from the ovisac, it is surrounded by part of the granular matter forming the proligerous disc. After fecundation, and as the ovum is passing down the Fallopian tubes, it acquires, according to Valentin, Mr. Wharton Jones, and other observers, an albuminous layer, which becomes adherent to the vitellary membrane, or the outer covering proper to the ovule. The albuminous layer thus formed, constituting the commencement of the chorion, is considered by many authorities to be the analogue of the white of the egg, which is formed round the yolk in the egg of the bird during its passage through the oviduct. It is uncertain whether the chorion is formed in whole or in part, before or after, the act of fecundation. It is probable, however, that in the case of ova which never become impregnated, the vitellary membrane becomes coated with a layer of albumen. The chorion is also found in cases of extra-uterine gestation, when the ovum becomes attached to the intestines or the ovarium. Mr. Goodsir is of opinion that the decidua reflexa also contributes, with the chorion, to form the counterpart of the white of the egg. In the first instance, the albuminous chorion is itself a supply of nutritive material for the ovum ; but it soon becomes converted into an absorbent organ, and obtains nutriment from the decidua and the decidual cavity. When first formed, the external surface of the chorion is smooth ; but in the earliest state at which this membrane has been seen in the uterus, it has been found covered with villi, which present a shaggy appearance, and are devoted to the absorption and assimilation of material for the support of the embryo. Each chorionic villus is bulbous in shape, and consists of an external membrane, including, within it, a number of cells, which are the principal agents in effecting absorption. At first these villi present no bloodvessels, but draw nutriment from the elements with which they are in contact by endosmosis, like the spongioles of a plant. Afterwards, when the allantois, with the umbilical artery and vein, have approached the chorion, the villi contain vessels, which become largely concerned in the nutrition and growth of the fœtus. In the second month, the villi of the chorion are of considerable size, and their cellular cavities communicate freely with each other over the whole surface of the chorion. After the end of the second month, they diminish in size, except at the site of the placenta, the diminution proceeding from below upwards, until the whole of the unattached surface of the decidua reflexa and chorion become smooth. By the end of the fourth month, the villi of the chorion on the side opposite to the placenta have quite disappeared. Dr. Robert Barnes suggests that these villi disappear by a process of fatty degeneration. Dr. Robert Lee believes that before the fifth month the cells of the chorion contain blood, which is poured into them from the cavernous structure of the placenta. The villi of the chorion do not become developed into the villi of the placenta, hereafter to be described, but form the most internal portion of these villi.

With respect to the formation of the Placenta, it will be remembered, that in the preceding chapter the Allantois has been described as arising from the caudal extremity of the fœtus, and conveying the bloodvessels, constituting the future umbilical vein and arteries, towards the surface of the ovum.

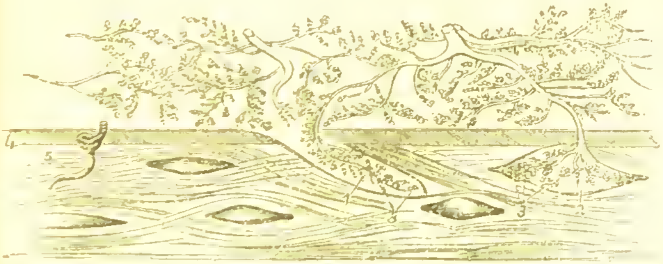
At the same time that this occurs, the decidua vera and decidua reflexa are acquiring considerable thickness at the point towards which the allantois is bearing the vessels, and a corresponding development of the villi of the chorion occurs in the same situation. From these elements the future placenta is developed. In obedience to the wonderful formative force which presides over all the operations of the embryo, the thickening of the decidua vera, and chorion, occurs upon the same aspect of the ovum, and towards this locality the allantois also directs itself, conveying thither the umbilical vessels. This occurs with almost unerring regularity, and in the fully-formed placenta the umbilical cord is generally implanted in or near the middle of the placentary mass. Sometimes, however, the umbilical vessels are inserted towards the edge of the placenta, and rare instances are met with in which the allantois projects the vessels towards the wrong part of the chorion, when the ovum perishes from a dislocation, so to speak, between the umbilical, chorionic, and decidual portions of the placenta. It is to Mr. Goodsir that we are indebted for the latest and best account of the arrangement of the chorion, decidua, and maternal and fœtal vessels in the placenta, and in describing them I shall chiefly follow that able anatomist.

If the uterine arteries and veins are examined in the gravid uterus while in connexion with the placenta, it is found that the uterine arteries pass from the walls of the uterus into, and through, the thickened decidua serotina. While passing through the decidual layer, the arteries make one or two serpentine twists, and hence are called the curling arteries of the uterus. They convey the maternal blood into large cellular chambers, which, as described by William Hunter, communicate with each other throughout the whole of the middle portion of the placenta. The blood is returned from this—which Dr. Robert Lee has called the cavernous structure of the placenta—by the uterine veins, which, as they enter the uterine walls, are dilated into sinuses of considerable size. These vascular cells, situated between the uterine arteries and veins, form in the aggregate an extensive placental cavity, or cavernous arrangement. Such is the entire circuit of the maternal portion of the blood in the placenta. The arteries, cellular chambers, veins, and sinuses, are lined throughout with a membrane continuous with the lining membrane of the vascular system of the mother. The large placental cells which have been spoken of as receiving the arterial blood from the uterus, and returning it by the veins, may be said to stand in the place of the capillaries in other parts of the body. The placenta itself is nourished by special capillary vessels, which enter it from the uterus. In immediate contact with the uterine surface, cellular bands are found crossing the sinuses, and threads of a similar character cross the cells or cavities of the placenta, and are attached to the placental villi, hereafter to be described. These bands and threads, which consist of files of cells, similar with the cells exuded from the surface of the decidua at the commencement of gestation, will also have to be reverted to presently. The whole of the placental vascular apparatus, on the side of the mother, may be said to be developed in the hypertrophied and metamorphosed mucous membrane, or decidua; and, in fact, this vascular apparatus and the decidua form together the whole of the maternal portion of the placenta.

The fœtal half of the placenta is found to consist of tufts, arranged in an arborescent form; of villi, which are attached to the branches of these tufts; and of the ramifications of the umbilical arteries and veins. The vessels of the tufts consist of a branch of the umbilical artery, and of a radicle of the umbilical vein. The fœtal blood enters by the arterial channel, and passes out by the veins; but between each branch of the artery and vein there runs, not an ordinary capillary, but a capillary vessel of large diameter, capable of carrying five or six blood globules abreast of each other. These peculiar vessels enter the villi, sometimes dividing and uniting again in the substance of the villi; at other times, one vessel passes into a single villus, or into two or three villi, and returns to the vein without dividing. These large capillaries present, in their course, dilatations and contractions, similar with those found in an intestine. The fœtal blood, coming to the placenta by the umbilical arteries, which carry the venous blood of the fœtus, passes through the intermediate vessels which have been described, and is returned by the umbilical veins after having undergone, in the placental tufts and villi, the changes necessary to fit it for the support of the fœtus; but there is no commingling of the streams of fœtal and maternal blood. The two sets of vessels are entirely separate, as was first demonstrated by William and John Hunter. As the uterine arteries and veins have developed themselves in the decidua, so the umbilical arteries and veins have ramified in the chorion and its villi, by a process similar with the formation of the first bloodvessels in the area vasculosa. (Fig. 40.)

Thus, to resume briefly, the placenta is formed by the fusion of the chorion and decidua, at the site of the attachment of the ovum to the uterus. The villi of the chorion, capped with a layer derived from the decidua, form the villi of the placenta. On the side of the mother, the vessels of the placenta consist of arteries and veins, with a series of cavernous cells between them. These cells, in the aggregate, form what has been termed the placental sac or cavity. On the side of the fœtus, the vessels consist of branches of the umbilical arteries and vein, with the large capillary vessels of the villi of the placenta between the two. The Maternal Portion of the placenta is formed by the decidua serotina, or developed mucous membrane of the uterus, the arteries and veins which enter the decidua from the uterus, the cavernous structure of the placenta, the blood circulating in these vessels, and the external layer of microscopic cells covering the placental villi. The Fœtal Portion of the placenta is formed of the chorion and its villi, the latter forming the internal portion of the placental villi, and of ramifications of the umbilical arteries and veins. In the process of the formation of the placenta, the chorion and decidua first become applied to each other. On the maternal side, at the site of the placenta, the uterine vascular system is developed in the way which has been already pointed out. On the fœtal side, the allantois projects the vessels which afterwards become the umbilical arteries and

FIG. 40.



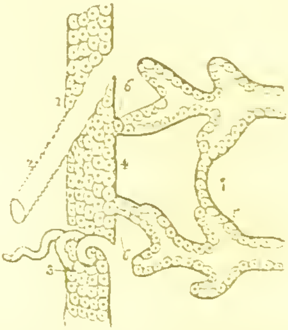
1. Substance of the uterus. 2. Cavity of a sinus. 3, 3. Fœtal tufts dipping into sinuses. 4. Decidual lining of the uterus. 5. Curling artery of the uterus.

vein to the chorion; and in the chorion a vascular system becomes developed in connexion with the umbilical vessels, which, taken together, constitute the fœtal portion of the vessels of the placenta.

To understand the intimate connexion with, and yet perfect separation from, the maternal and fœtal circulations in the placenta, and the mode in which the fœtus is nourished after the formation of the placenta, it will be necessary to describe a separate tuft of placental villi, or a single villus itself, the tuft being made up of an assemblage of villi.

Each Villus consists of its bloodvessel, a double series of cells, and its envelopes. The capillary is the central portion of the villus. Immediately around the vessel of the villus a layer of cells, derived from the chorion, is found. These cells are bounded by a fine membrane, which, in the early development of the embryo, constituted the external membrane of the villi of the chorion, but which, at a later period, forms the internal membrane of the placental villi. This part of the placental villi—that is, the internal layer of cells and the internal membrane—is, in fact, the remains of the original villi of the chorion.

FIG. 41.

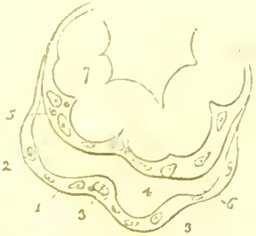


1. Decidua serotina. 2. A venous sinus passing obliquely through it. 3. A curling artery passing through the decidua from the uterus. 4. Lining membrane of maternal vascular system. 5. Tuft of fœtal portion of placenta. 6, 7. Connexion of tufts with each other, and with the decidua serotina.

On the outside of this inner membrane a cavity, or interspace, is met with, and, surrounding the space, there is a second layer of cells. The bands and threads found traversing the venous sinuses and the cavernous structure of the placenta have already been mentioned. Mr. Goodsir ascertained that these bands or threads are composed chiefly of cells, and are connected with the external cellular layer of the placental villi. He describes them as being, together with the external layer of cells belonging to the villi, the remains of the most internal portion of the decidua; and the external layer of cells represents, in his opinion, the remains of the secreting mucous membrane of the uterus, as it existed before the descent of the ovum through the Fallopian tube. Still more externally, each tuft of villi, or every single villus, is covered by the membrane lining the cavernous structure of the placenta, and which has been described as continuous with the lining membrane of the vascular system of the mother. Each tuft or villus projects into some part of the extended vascular cavity which exists between the uterine arteries and veins; and Dr. John Reid found that, in some instances, small tufts of villi entered the uterine sinuses, and could be drawn out from them without laceration.

Thus, each villus is composed of a bloodvessel, a layer of cells, and a fine membrane, derived from the chorion; of a second layer of cells, and a second membrane, derived from the decidua; with a small Cavity between the two; the whole of these structures being enclosed in the blood-membrane of the mother. (Fig. 42.) Thus formed, the villi lie in, and are bathed by, the maternal blood passing from the curling arteries of the uterus to the uterine sinuses, through the

FIG. 42.



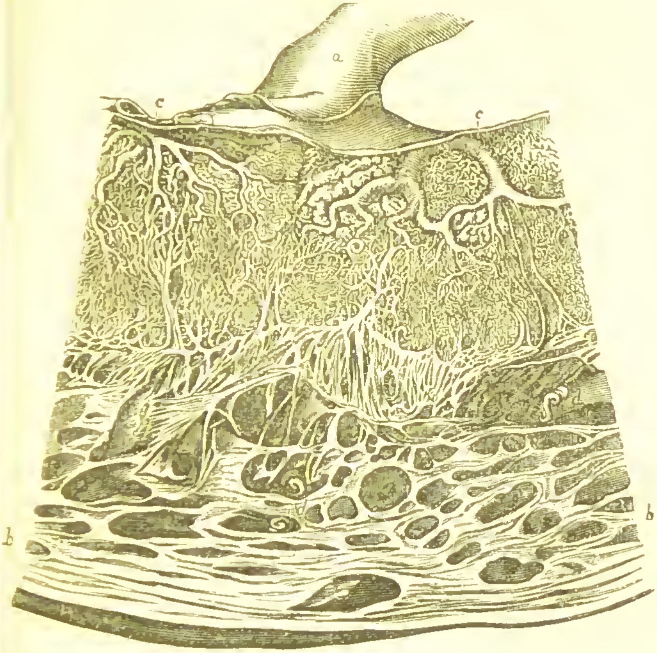
1. External membrane of placental villus. 2. External cells of villus. 3, 3. Germinal centres of external layers of cells. 4. Space between maternal and fœtal portions of villus. 5. Internal membrane of villus, or external membrane of chorion. 6. The internal cells of the villus, the cells of the chorion. 7. Loop of umbilical vessels.

great placental cells. Considering the placenta with reference to its lung function, the stream of maternal blood represents the atmospheric air, and the vessels of the villi take the place of the pulmonary capillaries. The blood is presented to the villi in the maternal channels in a perfectly arterial form, since there are no capillaries on the maternal side of the placenta, except those of the small nutrient vessels of the placenta itself, and the changes usually occurring in the passage of blood from the left to the right side of the heart are here effected by the capillaries of the villi and tufts, or the fœtal portions of the placenta. It may be said that the fœtal portion of the placenta is an apparatus for projecting a set of fœtal capillary vessels into a portion of the maternal circulation, which contains no capillaries, and where the capillaries of the villi become interposed between the maternal arteries and veins, in such a manner as, without any actual vascular continuity, to convert to the uses of the fœtus those changes which, in the systemic capillaries, are made subservient to the nutrition and renewal of the tissues of the different parts of the body. The capillaries of the fœtus become, in effect, in the placenta, a portion of the capillary system of the mother. In another sense, the fine blood membrane covering the villi, and the vessels of the villi, represent the lining membrane of the air vesicles and the pulmonary capillaries, and by the processes of endosmosis and exosmosis oxygen passes into, and carbonic acid and other excrementitious matters escape from, the fœtal circulation. Though the placenta is commonly spoken of as the lung of the fœtus, the changes effected in it, as far as the oxygenation of the blood is concerned, is more closely allied with the action of the gills of the fish, the blood of the mother representing the water passing through the branchiæ, but being more highly oxygenated. (Fig. 43.)

The pulmonic or branchial function is not the only one performed by the placenta in fœtal nutrition and excretion. The layers of cells derived from the decidua and chorion, and the vessels of the villi, are also analogous in function with the cells and lacteals of the villi of the intestinal tube. The external or maternal layer of cells is believed to grow continually by the assimilation of material from the blood of the mother. As these cells arrive at maturity, they burst, and their contents, which are of a milky appearance, are passed into the space or cavity between the two layers of cells, new generations of cells being formed to succeed them, from the germinal

pots found in the villi. This cavity, repeated in the count-
ess villi, constitutes the digestive apparatus of the placenta.

FIG. 43.



Section of fully-formed placenta, with part of the uterus. *a.* Umbilical cord. *b, b.* Section of uterus. *c, c, c.* Branches of the umbilical vessels. *d, d.* Curling arteries of the uterus.

e ruptured cells are constantly replaced by others, and, in
icroscopical examinations of the villi, cells of different sizes,
om nuclei up to fully-formed cells, are constantly found.
e chymous fluid, thus elaborated by the first layer of cells,
d passed into the cavity between the two layers of cells, is
xt assimilated to a further and higher degree, by the in-
rnal and fœtal, or chorionic, layer of cells, as in the former
se, by the growth and rupture of the cells, and the chylous
aterial produced is absorbed and carried into the fœtal circu-
ion by the vessels of the villi. The placenta may be said,
erefore, to perform in the fœtus the functions of the lungs,
d of the stomach and intestinal canal. In some of the lower

animals the connexion between the parent and the ovum is much less complicated than has here been described. In the bitch, for instance, Dr. Sharpey has shown that the glands of the mucous membranes enlarge, and that into their cup-like cavities, processes of the chorion, or large single villi, are received and became adherent during gestation.

The human placenta is, at the full term, round or slightly oval in shape, its average diameter being from six to eight inches, and its circumference from eighteen to twenty-four inches; in thickness it varies from one inch to two inches, according as it may be full or empty of blood. The internal surface of the placenta is smooth, and covered by a layer of the amnion and chorion. Through these membranes the branches of the umbilical arteries and vein are seen ramifying and dividing in every direction towards the circumference of the placenta before they enter the substance of the organ. The umbilical cord is generally inserted into, or near, the middle of this aspect of the placenta; but sometimes it is attached near the edge, forming what is called battledore placenta. The external placentary surface—that, namely, in contact with the uterus—is covered with a thick layer of decidua,—the decidua serotina. This surface is divided irregularly into a number of lobes, between which processes of the decidua slip down. When the placenta is expelled after labour, the divisions between these lobes are sometimes distinctly seen, owing to the laceration of the decidua which occurs on the separation and expulsion of the placenta from the uterus; but when gently peeled from the uterine surface, it is covered by an unbroken layer of the decidua serotina, marked by the openings of the decidual arteries and veins. The openings of the arteries are circular, some of them being as large as a goose-quill; while the openings of the veins are oval, and of considerably larger size. At the end of the second month of pregnancy, the placenta occupies about one-half of the entire surface of the ovum. As gestation advances, the placenta increases in size—particularly in thickness—but the increase is not in the same ratio with that of the uterus or the other parts of the ovum. At the time of labour it extends over about one-fourth of the entire cavity of the uterus. It must be said, however, that the placenta varies very much in size. As the rule, children with whom there is a large healthy placenta are strong and well nourished, while the contrary obtains in the case of thin and small placentæ.

Large placentæ increase, however, the risk and danger of hæmorrhage after parturition, which rarely occurs when the placenta is considerably below the average size. It is doubtful whether the placenta possesses nerves or lymphatics. Its nervous matter, if any, is probably diffused throughout its structure, as in the case of the lower classes of animal life, in which nervous functions are performed without the existence of any special nervous system.

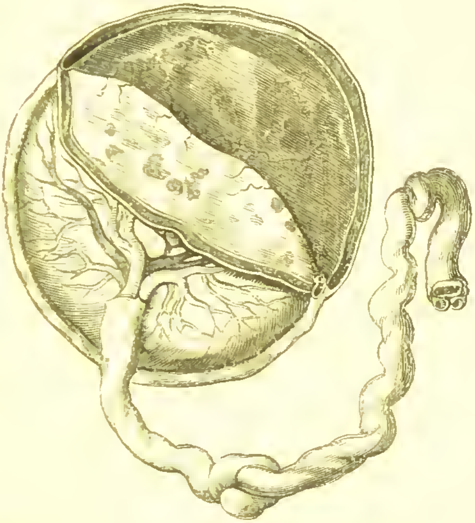
The placenta, at the full period, frequently bears upon its surface and structure evidences of its caducous character. This has been made known more especially by the able researches of Dr. Robert Barnes, followed by those of Dr. Druitt. The circumference of the placenta is often marked by a rim of yellowish material, consisting partly of fibrine and partly of fatty matter, and indicating the diminution of the area of the placenta in the latter months, probably by a process of fatty degeneration. The uterine surface of the organ is also frequently rough and gritty to the touch, from the deposit of earthy matter, chiefly carbonate and phosphate of lime. Patches of a lighter colour than the rest of the placenta are often seen upon its surface; these spots, consisting of fatty matter, and single villi and vessels in the interior, give unmistakeable evidence of commencing degeneration.

In the case of plural births, it generally happens that each child possesses its own involucra, and a separate placenta. Sometimes the placentæ are attached to different parts of the uterus, but most frequently the twin placentæ are side by side, the one apparently fused into the other to some extent, but without any vascular inosculation between them. In rare cases there is but one placenta, or the umbilical vessels of the twin or triplet children anastomose before their distribution to the placentæ; and cases have been met with in which there has been but one cord at the placental surface, and one placenta, the cord dividing to pass to the separate children.

The Umbilical Cord, or Funis, furnishes the channels of communication between the placenta and the fœtus. At the end of gestation, the cord varies very much in length. In some cases it does not exceed six or seven inches, while in others it has been known to measure five or even six feet. It contains the two umbilical arteries and the umbilical vein. The vein is much larger in diameter than the two arteries together, but the arteries are much longer than the vein. No doubt the blood, impelled by the fœtal heart, moves faster in the arteries than in the veins, so that the same quantity of blood passes through both. The vein in the umbilical cord and in its ramifications in the placenta is without valves, and conveys the purified blood and nutritive material from the placenta to the fœtus. The arteries convey the impure blood of the fœtus to the placenta. In these particulars the umbilical arteries and veins resemble the pulmonary vessels of the adult. Both arteries and vein are arranged in the cord in a spiral manner, the arteries being much more twisted than the vein, and coiling round it. The direction of the spiral turns made by the vessels is almost constantly from left to right. Sometimes a single or double knot is tied upon the cord, at others it is twisted once or twice round the neck, or it is coiled round the body and extremities, so as almost to resemble the Laocoon. The fœtal pulse is readily felt in the cord when the child is alive and before the funis has been separated. It occasionally happens that only one artery is met with instead of two, and cases have been observed in which the cord has contained two veins. The arteries do not communicate except by a branch near the surface of the placenta. Usually, the vessels divide on entering the placenta; but sometimes the division commences before they reach that organ, a circumstance which commonly diminishes the strength of the cord. (Fig. 44.)

The bulk of the funis is made up of gelatinous matter enclosed in cells which do not communicate freely with each other. The contents of these cells surround the vessels, and are a means of defence against pressure. The quantity of gelatinous material varies much in different embryos, and to this is chiefly due the thickness or thinness of the cord. The funis is also covered by a layer of chorion, and externally by a layer derived from the amnion. As in the case of the placenta, it is doubtful whether the cord contains lymphatics or nerves, or, at all events, if the nervous matter assumes a separate form. In this place a word may be said about the transmission of impressions from the mother to the fœtus. The absence of nerves in the placenta and funis would be no disproof of a communication between the nervous system of the fœtus and the mother. When the ovum consists of the blastodermic vesicle, and before the beginnings of the nervous system have been evolved in the course of development, it manifests properties which afterwards belong to the nervous system. In the unicellular animalcules, the same functions are performed which in higher animals, where the nervous ystem has assumed a separate type, are executed by the erves. In these peculiar organisms, the nervous system,

FIG. 44.

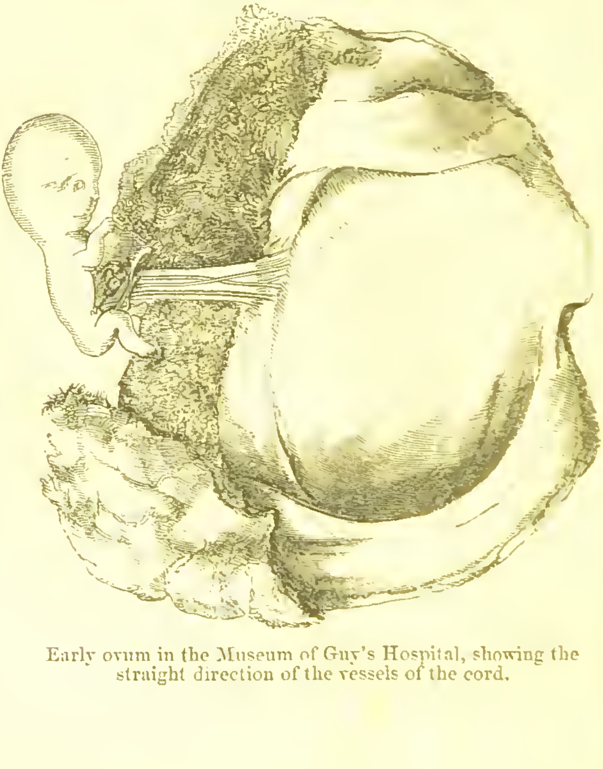


The umbilical cord and external surface of the placenta. The amnion and chorion raised from one portion of the placenta.

hough not collected into tubes, or surrounded by neurilemma, ervades the whole animal. This may be the case with the mbilical cord and the placenta, or further researches may emonstrate the existence of nerves in these temporary struc-ures.

No satisfactory explanation has hitherto been given of the iral arrangement of the vessels of the cord. When the rd is first formed, the vessels take a straight direction from e fœtus to the decidua, and the arteries and vein are not ose together. After a time they become coiled round each ther, and the cord diminishes in size, but increases in length. his increase is greater in the early and middle months of regnancy than subsequently, so that at the middle of ges-tion the relative length of the cord is greater than it is at e time of parturition. The same remark may be made re-ecting the quantity of the liquor amnii. When the cord is ng, and the amount of liquor amnii considerable, it is easy conceive that the fœtus may, by its own movements, or the changing positions of the mother, pass through a loop in the cord, and thus form a knot. There is indeed no other mode whatever in which a knot could be formed. In the same way the passing of the cord round the neck or body has been explained. It appears to me that this explanation may be extended to the curious spiral arrangement of the vessels, and of the whole cord. The cord is originally straight, and can only have been twisted by the movements of the fœtus, the placenta being a fixed point. It would seem that the fœtus, when it moves, always tends to move in a certain direction, and that the number of spiral turns in the cord must represent the number of times which the fœtus has slowly rotated in the uterus during the course of gestation. In no other way can we explain the alteration of the vessels from the straight to the spiral form. I shall have to revert to this subject when treating of the movements of the fœtus *in utero.*

FIG. 45.



Early ovum in the Museum of Guy's Hospital, showing the straight direction of the vessels of the cord.

CHAPTER VIII.

SIGNS OF PREGNANCY.

HE changes induced in the female economy by pregnancy are ery various and extended. From the initial steps in the act f reproduction to its final close, a great number of phenomena ccur in different and remote organs. The evidences mani-ested in the generative system are, no doubt, the most im-ortant; but the vascular system and its contained fluid, the ifferent portions of the nervous system, the digestive appa-atus, the skin, and the glands and their secretions, all con-ribute to the sum of those organic and functional conditions hich we group together as the "Signs of Pregnancy." The ifficulties attending the diagnosis in particular cases are mani-old. We are frequently asked for a positive opinion at an arly period of gestation, when the signs are not pronounced ith distinctness. The symptoms vary in different women, r in the same women at different times. Some of the more bvious signs may be wanting altogether, or they may be mulated by disease. Difficulties often arise from the mental ondition of the patient. We have at one time to deal with omen extremely desirous of having children, or, again, with omen who hold pregnancy in horror. In another class of ases our dictum is required when the most violent protesta-ons of chastity are made. Under these various circumstances, omen magnify certain symptoms, and suppress others, as far s possible, in accordance with their own wishes, or in order deceive the attendant. We should, to use a legal phrase, dismiss from our minds," in any case of doubtful pregnancy oming before us, all considerations except those of a physical aracter. Gooch expressed this when he said, with more force an elegance, that not "women's words, but their bellies" ould be believed in suspected cases.

It is of importance, not only that accoucheurs, but all me-cal men, should pay attention to the signs of pregnancy; herwise the practitioner may be confounded by the birth of child, when no increase of the population had been expected; ortion may be produced unwittingly by emmenagogues or eatments applied to the examinations; or, under the false impression that pregnancy exists, serious disease may remain for months untreated and unchecked. In all cases which admit of doubt, the medical attendant will do well to suspend any positive judgment until the evidence one way or the other becomes certain, and in the meantime to be cautious in all that relates to the treatment and management of the patient.

The most convenient method of relating all that pertains to the signs of pregnancy is to consider them very nearly in the order in which they arise, by which means a double advantage will be gained: the symptoms of commencing and advanced utero-gestation will be grouped separately, and a method of examination will be fixed upon the mind.

The first indications of pregnancy are to be found in the reproductive organs. No sooner has a fruitful congress taken place than a change in the condition of the Uterus occurs—from a state of comparative quiescence, in which, apart from menstruation, the decay and repair common to all other tissues is its only function, it emerges into energetic activity, constructs a nidus for the reception of the expected ovum, and commences those intimate changes which result in the transformation of a fibroid mass into a muscle of immense energy. The greater the functional activity of an organ, the greater the amount of blood which passes through it in a given time. The uterus is no exception to this general law, and hence, when an examination is made per vaginam but a few days after conception, the uterus is found hot, turgid, and almost erect, as if endowed with the properties of erectile tissue. This state of the organ is by no means persistent: before any great length of time it gives way to softness and increased bulk; the uterine vessels increase in size from day to day; small twigs of artery become developed into vessels of considerable calibre; there are capillaries where none apparently existed before; the cellular tissue of the organ is in a manner unravelled by the dilated and dilating vessels, as well as by certain histological changes, and the parenchyma is moistened by interstitially-effused serum. The body of the impregnated uterus is, in all ordinary cases, slightly anteverted during early pregnancy, and the enlarged body of the organ may be felt by the experienced finger in the anterior vaginal cul-de-sac. A soft and cushiony state of the os uteri, with the detection of the dense body of the uterus between the anterior lip and the pubes, are amongst the earliest signs which lead us to believe in pregnancy. The unimpregnated uterus may be anteverted, but this condition is not attended by a soft condition of the os uteri.

Examined with the speculum, the os and cervix uteri are somewhat increased in size, the tissues appear less dense than in the impregnated state, and the white plug of mucus is distinctly visible in the lower parts of the cervical canal. Owing to the permanent condition of the plug during gestation, and the increased acidity of the vaginal secretion, the mucous plug is more firmly coagulated, and is of a more intensely white colour than usual.

Suspension of the Catamenia is commonly the first symptom of pregnancy which arrests the attention of an intelligent female who has exposed herself to the possibility of impregnation, and is perhaps the one in which women most firmly rely, especially if any abdominal enlargement coincides with the absent function. Its value as evidence of utero-gestation is modified by the fact, that the suspension of the menses, although tolerably constant, is liable to many aberrations, and is indicative of other conditions than pregnancy. Menstruation, or at least a periodical sanguineous discharge, may continue through a part of or the whole term of utero-gestation. Cases in which it has appeared once after impregnation are recorded by Johnson, Puzos, Desormeaux, Dewees, Stein, Gardien, and others. Burton, Maunsell, Campbell, and others also mention cases in which it appeared three, four, and six times, and similar instances have fallen under my own observation. There is a case detailed in Heberden's "Commentaries," in which the function persisted during the whole term of pregnancy; and Deventer, Hosack, and Haller testified to the occasional appearance of the phenomena. Deventer and Baudelocque speak of females in whom the catamenia appeared only during pregnancy, and a still more remarkable abnormality has been witnessed in some women, who have performed this function for the first time subsequent to impregnation. The necessity of preserving the outward appearance of virtue has instigated women to feign themselves regular by smearing their persons and staining their linen periodically. Belloc mentions such an instance, and suggests that if the vulva be washed, and the discharge does not reappear after a short interval, the case should be suspected.

An exactly opposed series of cases to those we have been considering is constituted by instances in which the catamenia are suspended, and pregnancy does not exist. Cold, shocks of any kind, exhausting discharges, incipient phthisis, the worst forms of ovarian disease, and several other circumstances, frequently suppress this function. Women who are nursing, as a general rule, do not menstruate, and, as the catamenial climacteric approaches, intermissions, even of several months, are frequent. There are cases again in which the history of the menstrual function is of no use whatever in determining the question of pregnancy. Some women prove pregnant before menstruation has ever occurred; some after it has apparently ceased altogether; and others at a time when the function has been suspended for several periods by known causes, such as lactation. The best rule, perhaps, for applying the catamenial test to cases of suspected pregnancy is, that if the suspension has persisted for several months, if, at the same time, the health has not suffered, and if the person is not giving suck, the probability that she is pregnant has reached the highest point to which it can be brought by evidence from this source alone.

Various derangements of the Digestive Organs usher in pregnancy. The exact period at which they occur is various and uncertain. In some women, nausea follows close upon the heels of conception; in others, no gastric sympathies appear until two or three months have elapsed; but from the second to the fifth or sixth week is the general period at which they are established. They usually decline about the fourth month; but their disappearance is liable to the same uncertainty as their invasion. Nausea, vomiting, eructations, heartburn, a peculiar sense of sinking at the epigastrium, cravings for peculiar or particular articles of diet, and antipathies to other comestibles, are the ordinary manifestations of gastro-uterine irritation observed. In general, the nausea, vomiting, and sinking occur upon first rising or assuming the erect posture, and persist only for a short time. The comparatively universality of this rule has caused these symptoms to be expressed by the term "morning sickness," a phrase which has become almost vernacular. It is obvious that the causes of gastric derangement, similar with those alluded to, must be numerous; and hence, except as corroborative proof, we can throw little light upon the diagnosis of a case of doubtful pregnancy by discovering that sickness has occurred in the morning, or that an affection has been shown for chalk, slate pencil, or some previously abhorred article of diet. The value of this, as of several other signs of pregnancy, rests upon its coincidence with other recognised signs. The synergic action between the stomach and the uterus, both as regards secretion, sensation, and motor action, are amongst the most remarkable phenomena of reflex nervous action. In the case of the gastric irritation of pregnancy, it is worthy of remark, that it is during the early months that the affection is most common and constant. It is probably caused by the distension and evolution of the dense structure of the uterus after impregnation, or by the pelvic irritation caused by the gravid uterus before it emerges from the brim, or from both these causes.

Certain Glandular Sympathies are excited during pregnancy, of which one of the most remarkable results is Salivation. This form of salivation is, of course, quite distinct from mercurial or other metallic affections of the salivary glands, differing in the absence of fœtid breath, of sore gums, or the prostration observed in such cases. It is probable that the watery vomitings of pregnant women partly depend on increased pancreatic secretion—a supposition which is favoured by the analogy between the structure and secretion of the pancreas and the salivary glands and the frequent excitation of the latter during pregnancy. Cases illustrating utero-gestative salivation are mentioned by Dewees, Van Swieten, Dr. Blundell, and others. In a slighter degree, such cases are not uncommon.

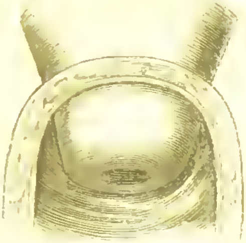
When pregnancy is but a few weeks advanced, the Mammæ begin to take on certain new actions, preparatory to their perfection as secretors of a nutritive fluid. The changes which take place in the breasts at puberty may be called the primary evolution of the mammæ. This is parallel to, and synchronous with, that evolution of the uterus and ovaries which produces the capacity to conceive; and the changes which take place in the mammæ after conception constitute their secondary evolution, and are parallel to, and synchronous with, those uterine changes, which give the capacity to nourish. The first indications of pregnancy given by the mammæ consist of a certain sense of fulness and weight, with shooting pains, these latter being sometimes confined to the gland itself, but at other times extending to the mamilla, where they may be almost constant, producing what is technically called "mastodynia." The afflux of blood to the breast which now takes place speedily replaces the mere sense of fulness by actual increase of volume; the gland becomes hard, knotty, and tender to the touch, and large blue veins may be seen meandering over its surface, just below the integument. A very cursory examination will suffice to distinguish this condition from the mere increment in bulk attained by persons who are growing corpulent. A deposit of fat does not give the same knotty feel to the breasts; the vascular supply is not sensibly altered, and a great volume may be acquired without any of those peculiar white, shining streaks appearing on the surface of the integument, which are the result of distension by growth of the gland. The most probable embarrassment is likely to occur in women who, having previously borne children, and having reached the threshold of the sexual climacteric, have their menses temporarily suspended, their breasts painful, and their stomachs irritable. Almost any uterine irritation will produce enlargement of the breasts and sympathetic mammary pains. Retention of the menses from an imperforate hymen, fibrous tumours of the uterus, and ulceration of the os and cervix uteri, are frequently concerned in these mammary changes; and habitual and excessive copulation sometimes has the same effect. These possible causes will, however, be remembered and sought for where any doubt exists. The most characteristic changes are to be found in the nipples and the surrounding areolæ. The nipples become turgid and more prominent, and the discs around them assume a darker hue, more marked in persons of a dark than of a light complexion. Ingleby observes that the cuticle of the areola becomes scaly, and that the general surface of the breast presents a mottled appearance. As pregnancy advances, especially if it be a first pregnancy, the deposit of pigment in the areolæ increases, the areolæ themselves become moister, and the follicles studding their surface are prominent, distended, and bedewed with transuded fluid. In women with dark hair and eyes, the outer part of the circle surrounding the mamilla presents an appearance of small white patches, as if the colour had been discharged by a shower of rain. Dr. Montgomery trusts more to the appearance of the follicles, the moisture on the areolæ, and the turgescence of the parts, than to the deposit of pigment, which results occasionally from uterine irritation, and not unfrequently is persistent after the first pregnancy. The mamillæ are sometimes so effectually compressed by tight corsets as never to rise above the level of the mammary surface until artificially drawn out. About the sixth or seventh month numerous white, silvery streaks make their appearance on the surface of the breast; they are exactly similar to those found on the abdomen, and are called lineæ albicantes. They are in reality the exposed floors of furrows which naturally exist in the skin, and they are unfolded in consequence of the distension of the subjacent gland. Once formed, they do not entirely disappear, and are therefore of little value as a sign of pregnancy, except in primiparous women. In common with the altered nervous and vascular condition of the mammæ, their secretive endowments are called into play at a variable period, ranging from the fourth or fifth month to immediately before labour. It may be said, as a general rule, that no secretion of milk takes place until eight-and-forty hours after labour; and, on the other hand, there are so many irregularities regarding the secretion of milk, that neither its absence nor presence can be rated at any considerable value, as proof or disproof of utero-gestation. Suppression of the milk in persons who are nursing and liable to impregnation, is a more valuable sign of pregnancy than the converse condition. Lastly, it must be remembered that recent abortion and lactation produce the same conditions of the mammæ as obtain in pregnancy.

The Size and Form of the Abdomen next arrest our attention in relation to pregnancy. During the first two months, no enlargement is visible, or if visible, can be trusted, as flatulent distension, and other evanescent conditions of the abdominal contents, produce variations in dimension beyond the possible limits of any size that may be attained at such an early period. At first, indeed, the belly becomes flatter, and the navel is deeper, as if dragged down by the increased weight of the uterus; there is a French proverb, "en ventre plât, enfant il y a," and in this, as in many other instances, popular belief coincides with scientific observation. The traction at the navel is said to be painful occasionally, and the navel itself tender to the touch. About the third month, abdominal enlargement becomes obvious in the nude figure, and from this period steadily increases until nearly the end of pregnancy. By the fifth month, the navel has become shallower, and the uterus may be distinguished through the abdominal walls; at the sixth month, it is flattened out; and in another month protrudes beyond the level of the general surface of the abdomen. Numerous other circumstances give rise to enlargement of the abdomen. Ovarian dropsy, ascites, certain diseases of the spleen and liver, flatus in the bowels, accumulated fæces, tumours of the omentum, and unusual deposition of fat in the omentum and abdominal walls, as well as hydrometra, physometra, fibroid and other tumours of the uterus, and intra-uterine polypi, all produce an increase in bulk, which may to a certain extent simulate pregnancy. It is necessary to observe, that some of these conditions may co-exist with pregnancy. A little care will, however, suffice to distinguish between the above-mentioned forms of enlarged abdomen, and an abdomen distended by the gravid uterus. Such a mistake as that quoted by Gooch from Lowder's MS. lectures, where a practitioner mistook pregnancy, with a distended bladder, for ovarian dropsy, and thrust a trocar through both sides of the bladder, and through the walls of the uterus, into the child's head, would be unpardonable at the present day. The history of the enlargement, its form, and the evidence procurable by means of auscultation, palpation, and percussion, ought to preclude the possibility of any grave error in practice. Inquiry will almost always elicit the fact, that in ovarian dropsy the enlargement has, at first, been on one side, and fluctuation is easily distinguished. In ascites, there is a previous history of disease, and the form of the abdomen, in the recumbent posture, is widely different from the ovoid belly of a pregnant woman; the contained fluid, in a case of ascites, from its obedience to the law of gravitation, produces a bulging between the crest of the ilium and the false ribs, the anterior and middle aspect of the abdomen being its flattest part. Enlargement of the liver and spleen increases from above downwards, and tympanitis is extremely easy of detection. The only real embarrassment arises from those cases in which the uterus itself is distended, and then other symptoms must be referred to, in order to determine the question. The elastic nature of the uterine tumour is simulated by no other abdominal enlargement, and is so far valuable as evidence of pregnancy; but fluctuation may be obtained where the liquor amnii is very superabundant; or an ovarian cyst may intervene between the gravid uterus and the surface of the body, so that the absence of the peculiar impression conveyed by palpation is not so negative as the converse is positive. When a blighted fœtus is retained in utero, no further increase in size takes place; and this contingency must not be forgotten in forming an opinion as to the condition of a woman who has had progressive abdominal enlargement, with other signs of pregnancy up to a certain date, followed by recession of her uterine sympathies, &c., and arrest of increase in bulk. Silvery streaks appear on the surface of the abdomen when it becomes much distended; once formed, they are permanent, but they do not by any means occur in all cases. They are only of use as a sign of pregnancy in first cases, or where long intervals have passed between successive pregnancies. Dr. Cormack has drawn attention to the dark line which occurs during pregnancy in the median line of the abdomen. It is constant in the latter part of gestation, but being the result of distension, it is present in the case of other abdominal tumours.

Reference has already been made to the condition of the uterus immediately after impregnation. During the first three months of pregnancy the lower part of the uterus feels soft and almost œdematous; the os, which had before been firm and with well-defined lips, becomes of a more rounded form, and the tip of the finger can be inserted between them. In first pregnancies such changes are more marked than in multipara, especially if the parts have been at all ruptured during labour. The whole body of the uterus sinks lower down in the pelvic cavity, and the os can be felt, not only lower down, but somewhat displaced towards the hollow of the sacrum; the fundus of the organ is anteverted to a corresponding extent, and it is partly to this circumstance, as well as to the intimate sympathy between the uterus and the other pelvic organs, that the frequent micturition and sense of weight in the rectum, which accompany early gestation, are attributable. Approaching menstruation, or the engorged condition of the womb, sometimes met with in menorrhagia, simulates these earlier changes of pregnancy to some extent. The body of the uterus can be distinguished more readily in the anterior vaginal cul de sac as pregnancy advances, and about the fourth month the fundus may occasionally be felt just above the pubis. With its gradual increase in bulk the womb has gradually risen to the pelvis. Many authors state that the uterus rises suddenly out of the basin of the pelvis into the general abdominal cavity. There is, however, no real proof that the uterus at once emerges from the pelvis, and there are many circumstances which render it extremely improbable. The idea of the sudden escape of the uterus from the pelvis involves a notion of some great and sudden increase in the contents of the cavity, or of the sudden removal of some impediment. In cases where there is much antero-posterior contraction of the brim, a malformation which involves less contraction of the cavity than most other distortions, permanent incarceration should result at or about the fourth month, if the uterus really remains entirely in the true pelvis until that period, and cases of extreme contraction of the brim or pelvis generally, should have a history of difficulty at the time of the supposed emancipation of the womb. No such histories are on record. The real state of the case appears to be, that the uterus rises slowly out of the pelvis, partly because its increase in bulk is from above, the fundus being the first part developed, and the cervix the last; partly because it is in reality a wedge with the apex below; partly because the bladder pushes the uterus upwards every time it is distended, directly, by means of the fluid contained in it, and indirectly, by elevating the vesical layer of the pelvic fascia, to which circumstances may be added the obliquity of the pelvis, and frequent changes of position on the part of the mother. About the fifth month the uterus is found to have risen half way to the umbilicus. It is now that the cervix uteri begins to shorten its cavity, being taken up into the general uterine cavity by a process of development commencing at the junction of the cervix with the body of the organ, and terminating at the os itself. The finger may be inserted between the lips of the mouth of the uterus with greater facility as each month passes, and the follicular glands of the cervix may be felt just within. At the same time the orifice of the womb moves upwards and backwards towards the sacral promontory, and by the time it has reached its most posterior and superior position, the cervix has completely disappeared, the os uteri being a mere rim. Externally, the uterus reaches as high as the umbilicus at the sixth month, half way between the umbilicus and the ensiform cartilage at the seventh, and as high as the latter structure at the eighth; after the eighth month the increase in size is more observable in the way of increased tension, and indeed shortly before labour sets in, an apparent diminution in size takes place. The head, a presenting part of the child, may now be felt through the os uteri. (Figs. 46—49.)

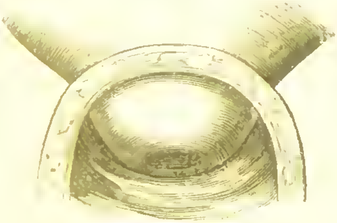
Quickening generally occurs when pregnancy is advanced about half way; Denman gave the sixteenth week as the period at which it most commonly occurs, and Dr. Fleetwood

FIG. 46.



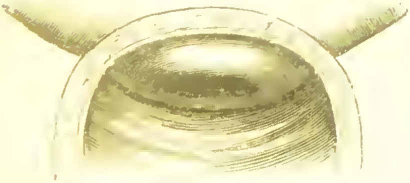
Os and cervix uteri at the third month of gestation.

FIG. 47.



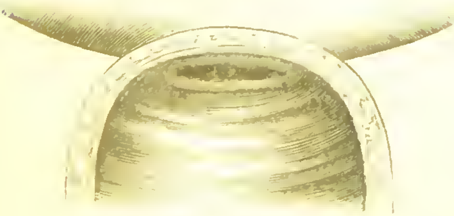
Os and cervix at the sixth month.

FIG. 48.



Os and cervix uteri at the eighth month.

FIG. 49.



Os and cervix at the full term.

Churchill gives nearly the same average; Dr. Ramsbotham places it between the sixteenth and eighteenth week; Puzos had known it to occur at the end of two months, and it has not unfrequently been postponed till the sixth, seventh, and eighth months; it is, in truth, very variable, and instances are met with in which it does not occur at all. By some authors it is believed that quickening is the first sensation by the mother of the movements of the fœtus; others have supposed it to be a sudden ascent of the uterus from the cavity of the pelvis. The nature of the sensation will be differently described by different women. The child of Elizabeth is said by St. Luke to have "leaped in her womb" when she heard the salutation of Mary; in some women it is described as a pulsation, and others speak of it as a fluttering or an occasional shock, attended by a sense of faintness, sickness, and sometimes a slight sanguineous discharge. The physical cause of the symptom is doubtless motion of the fœtus, and the period at which it occurs is most probably due to the increased size and activity of the child, which permit it to come into occasional contact with the walls of the uterus, through the liquor amnii. Accidental circumstances may perhaps give rise to the particular motions first perceived, and it may occasionally happen, that these accidental stimuli being wanting, no perceptible motion occurs. The value of the symptom as a sign of pregnancy depends partly upon whether the patient has experienced these sensations before, and partly upon the amount of credence to be attached to her statements and opinions. The motions of the fœtus having been once established, they may continue to be felt at intervals of variable duration by the mother or by another person. Dr. Montgomery thought he could determine the motions of the fœtus before the mother was conscious of them: it must, however, take a very prolonged examination to elicit any information at so early a date, and even then some doubts may be entertained as to whether the observation can be trusted. At a later period, it becomes very easy to perceive the movements of the living fœtus. As the points by which it comes into contact with the uterine walls gradually multiply, more trifling circumstances suffice to set up excito-motor actions: the mere pressure of the hand upon the abdomen will sometimes produce palpable kicks. It is not always easy to distinguish between the movements of the fœtus and some other movements which occur in the pregnant woman. The uterus and

dominal walls have special actions of their own. The uterus
subject to peristaltic contractions, which, starting from one
d of the organ, traverse its whole extent like a wave. They
ay be discriminated from the fœtal kicks or plunges by the
avelling ridge which they produce, and which may be felt
nder the hand. At other times, the uterus contracts at cer-
in portions. These contractions shift from one place to an-
her, and convey the impression to the mother that the child's
ad is moving about. It is the peristaltic actions of the
erus, and not the movements of the fœtus, which are pro-
uced when the hand is dipped in cold and acid water. The
dominal muscles are subject to involuntary contractions,
ising from the irritation which the contact and pressure of
e uterus produces, but it is voluntary contraction of the
dominal muscles which most usually simulates the motions
the child.

In the year 1818, a great advance was made in the diagnos-
s of pregnancy. Mayor, of Geneva, published a memoir in
e "Bibliothèque Universelle," on the detection of pregnancy
the pulsations of the fœtal heart. This discovery attracted
ry little attention until four years afterwards, when Kerga-
dec published a systematic work on Auscultation as applied
pregnancy; he added a knowledge of the so-called bruit
acentaire to M. Mayor's discovery. At a later period, Dr.
ennedy discovered the funicular pulsations, and Naëgele de-
ribed what may be called "sounds of the displacement of
e fœtus." Other sounds may be heard on applying the
ethoscope to the abdomen of the pregnant woman: they are
e products of muscular action. The value of these auscul-
tory phenomena is very different, but there are no other
gns of pregnancy so unequivocal, or upon which we may so
fely rely. The subject of utero-fœtal auscultation in this
untry has received its chief development from the writings
Dr. Kennedy, and the excellent translation of Naëgele's
rk on Auscultation by Dr. West.

The uterine souffle, bruit placentaire, or placental murmur,
it is called by different authors, is distinguishable before
y of the other intra-uterine sounds. Great difference of
inion has existed as to the earliest period at which it may
heard; a similar variety of opinions has prevailed as to the
act seat of the murmur. Dr. Kennedy averred that he had
ard it at the tenth week, while Velpeau states that the
re fact of its having been discovered even at the third

month is sufficient proof that whatever the sound observed may have been, it could not have been produced by the utero-placental circulation. It may be said, as a general rule, that until the fourth or fifth month, that is, until the uterus has risen out of the pelvic cavity, the uterine souffle is inaudible; after that period it may generally be heard on any point of the region of the uterus which is accessible to the ear. The situation of the sound will vary as pregnancy advances; in the earlier part of the second moiety of utero-gestation, it is heard nearer the pubes, and it gradually ascends from week to week. It is seldom heard quite at the fundus uteri or in the lumbar regions. The character of the sound is very different in different persons, and varies in the same individual; sometimes it is a hoarse and sometimes a soft blowing murmur, at others it is a cooing sound, and, again, it is sibilant or musical. Now it is immediately beneath the ear, and again is distant. It is synchronous with the radial pulse. It is modified by the pressure of the stethoscope, and may disappear and recur again under the instrument. On some days, in the early part of its appearance, it is absent, and on others it is present. Whatever may be the exact physical cause of this sound, there can be little doubt now that it is produced in the walls of the uterus, and not, as Hohl supposed, in the placenta, or, as Kiwisch believed, in the epigastric, and others, in the iliac arteries. It may be well to state the foundations for this conclusion; the same sound has been heard in cases of fibrous tumour and vascular sarcoma of the uterus, and in moles; it is often heard over the whole surface of the uterus, accessible to the stethoscope; it persists for a short time after delivery; it has been heard in cases where putrid fœtuses have been born, and the placenta found with its vessels full of thickened and coagulated blood. These reasons appear to be conclusive against the placental theory, and others exist which eliminate the iliac arteries or aorta from the question. If the sound were produced by pressure on the iliac arteries or aorta, it should disappear when that pressure is removed by the assumption of the prone posture, whereas it persists in every position; pressure should intensify the sound if this hypothesis were correct: the contrary frequently obtains, and indeed the murmur not unfrequently disappears under pressure, even when it is made on the anterior aspect of the uterus directly towards the spine. And finally, the metroscope of M. Nauche, applied to the cervix uteri, in the vagina, transts the sound when abdominal examination has failed to dis- guish it. The sound is heard most distinctly at the usual e of the attachment of the placenta, and this circumstance pears to have misled Hohl and others; it is, however, only accordance with the fact that the uterine vessels are largest ere the placenta is attached. As a sign of pregnancy, the erine souffle is extremely valuable; it can be distinguished m any possible arterial imitation by the absence of impulse, by changing the position of the patient; and a very simple ice will distinguish between it and the vesicular murmur, the latter should happen to be audible lower than usual, for the stethoscope be moved gradually upwards, any lung und will of course become intensified, whereas the uterine ffle will diminish. The uterine souffle is no proof of the of the fœtus, nor can it be made use of to determine the ition of the child, or whether the uterus contains twins.

Widely different from the foregoing acoustic phenomena is double pulsation discovered by Mayor. The ticking of a tch heard through a pillow has been aptly compared with rapid pulsations of the fœtal heart, as heard through the rus and abdominal walls. There is a distinct rhythm in se sounds, consisting, as in the perfectly developed indi- ual, of two sounds of unequal length, followed by a pause. number of pulsations varies, according to M. Jacquemier, m 108 to 160 per minute, but 130 will represent the average quency of the embryonic pulse. It, however, subsides, to a tain extent, during the last month of pregnancy, a change ich is continuous with that well-known declension in the quency of the pulse which advances pari passu with in- asing age. Dr. Hope gave 150 as the fœtal pulse at the h month, and 120 as that of the ninth month. The beating the fœtal heart may generally be distinguished, for the first e, during some part of the fifth month. At first the sound ery feeble and distant, but by degrees it acquires strength, the diminution of the liquor amnii, by allowing the fœtus come into contact with the uterine walls, facilitates the duction of the sounds to the ear of the observer. Nothing be more shifting and variable than the sounds of the fœtal rt—now they may be heard on one side of the abdomen, now on another; their position even changes during the e examination, and sometimes they suddenly cease, or er escape observation, for days together. A like change their intensity occurs, but frequent observation detects steady increase in their force. Occasionally, they are never heard during the whole of pregnancy, and the absence of these sounds is not conclusive of the death of the fœtus, unless they have undergone a gradual declension in intensity previous to their cessation, and even then it is perhaps safer to look for corroborative proof elsewhere before coming to a decision. They are accelerated temporarily by the motions of the fœtus. The area over which the sounds of the fœtal heart may be distinguished varies according to the force of the heart's action, the amount of liquor amnii, and the position of the child. There is only one possible circumstance which can at all imitate the sounds of the fœtal heart, and that is, when the sounds of the maternal heart, from emotional or other causes, are increased in frequency and force, and conducted through the diaphragm and liver to the uterus. In these cases, the pulse at the wrist and the supposed fœtal pulsation are synchronous. The same device which has been recommended for distinguishing between the vesicular murmur and the uterine soufflet will establish the differential diagnosis in this case.

Dr. E. Kennedy states that, "in some cases, where the parietes of the abdomen and uterus were extremely thin, he has been able to distinguish the funis by the touch externally, and has felt it rolling under his finger, and then applying the stethoscope, its pulsations have been discoverable, remarkably strong." Dr. Churchill and Naëgele support Dr. Kennedy against Haus and Hohl, who deny the fact. The observation, however, although it reflects much credit upon the acumen of Dr. Kennedy, can hardly be of practical use, because, where the abdominal and uterine walls are so thin as to permit us to feel the pulsation of the funis through them, the other auscultatory signs of pregnancy, and the evidence obtained by palpation, must already have set the question at rest; and except under such circumstances, it must be very difficult to discover the funicular soufflet. The sounds of the displacement of the fœtus consist of shocks—sometimes quick, like a light tap, and at other times more like a heavy plunge; and there are also friction sounds, which are evidently produced by the gliding of the surface of the fœtus over the inner uterine surface. Naëgele avers that these sounds may be heard before quickening has taken place.

Ballottement is a means of acquiring information as to the circumstances of pregnancy, first made use of in France.

nere are two kinds of ballottement—the internal and the
ternal—the first of which is practised by one or two fingers
troduced into the vagina, and the latter by manipulations
plied to the surface of the abdomen. "Ballotter" signifies
o toss a ball, as at tennis;" and the manœuvre in question
a kind of tossing-up of the fœtus in the waters of the
mnios. The method of performing the internal ballottement
as follows:—The woman is placed in bed, with the trunk
a semi-recumbent position, so as to make the axis of the
erus coincide with a line passing perpendicularly from the
ndus uteri to the ground, and to bring the uterus as low
wn into the pelvis as possible. The bladder and rectum
ould have been previously emptied. The first or two first
gers of one hand must now be introduced into the vagina,
d applied to that part of the cervix uteri, or uterus, which
situated between the anterior lip of the os and the pubis.
e other hand, or the hand of an assistant, should then ex-
ise steady pressure on the abdomen; and a deep inspiration
the part of the patient will finally bring the uterus into the
st favourable position for the experiment. Immediate ad-
ntage must be taken of the temporary cessation of breathing
make a rapid jerking push against the uterus with the tips
those fingers which are applied to it in the vagina. If
re is a fœtus in the uterus, and if the proper period of
gnancy has been selected, a hard body will be felt to recede
m the fingers as if rising in the intra-uterine fluid, and in
econd or two it will fall again on the tips of the fingers.
is is the internal ballottement. The period at which it is
licable is from the end of the fourth to the end of the sixth
nth, as a general rule; but it must vary according to cir-
astances, such as the bulk of the fœtus, the quantity of the
uor amnii, and the width of the pelvis. When once disco-
ed, it is a tolerably conclusive proof of pregnancy. The
ernal ballottement is best performed by placing the woman
her side, on the extreme edge of a bed, so as to have her
omen projecting beyond it. One hand should then be
lied to the undermost side of the belly, and another to the
osite surface, in order to steady the uterus. If a fœtus is
sent, a similar manœuvre may now be practised, as in the
rnal operation; a sudden impulse from the lower hand
pelling the fœtus towards the upper part of the amnion
from whence it will gently descend again upon the same

hand. If the fœtus is very small, no sensation will be imparted to the hand by its descent; and if the liquor amnii be scanty and insufficient to float the child, the experiment will entirely fail. Regarded as evidence of pregnancy, the external is very inferior to the internal ballottement. It is not applicable in so early a stage of pregnancy, a much larger bulk being necessarily obtained before the uterus is brought into sufficiently extensive contact with the abdominal parietes for such delicate manipulation. After the six months of utero-gestation, the quantity of liquor amnii becomes relatively decreased, and the fœtus is not so well floated, except in some few cases in which the fluid is preternaturally abundant. A kind of spurious ballottement may be sometimes found in cases of ovarian dropsy, where a pedunculated cyst floats within a larger cyst. The ballottement is no proof of the life of the fœtus. It should be mentioned, that great length of the cervix uteri, or a footling position of the fœtus, will make the internal process difficult, and sometimes impossible.

A substance called Kiestein, which occurs in the urine, is one of the minor signs of pregnancy. So far back as 1486, Savonarola gave an account of a urinary deposit which was evidently this material. He compared it to carded wool, but did not pursue its history beyond this point. MM. Nauche and Eguisier, in publishing their supposed original discovery of this matter, made use of Savonarola's simile, speaking of it as a cotton-like cloud; and they gave a further detail of the transformations it goes through, which are as follows:—The cotton-like cloud, in the course of from two to six days, becomes resolved into a number of minute opaque bodies, which rise to the surface, forming a fat-like scum. This persists for three or four days: the urine then becomes very turbid, and minute flocculi detach themselves from the crust and sink to the bottom of the vessel, until the whole pellicle disappears. This crust never becomes mouldy, and never lasts more than three or four days. The pellicle contains crystals of triple phosphate, fat, and a peculiar nitrogenous body allied to casein. It is supposed that during pregnancy, the mammæ secrete a certain quantity of abortive milk (if the expression may be allowed), which is again taken up into the circulation, and excreted by the kidneys. Analogous facts exist regarding other secretions. Casein has been found in the blood by MM. Grullot and Leblance during lactation, and thus an adlitional probability has been given to the truth of this hypothesis. When kiestein is present in the urine, it persists rom the end of the first month to delivery. A minute invesigation of the exact nature of the body, and the opinions of ll writers on the subject, is unnecessary; but the following onsiderations will point out how far it is really valuable as ffirmative or negative of pregnancy. It has been found in the urine of women not pregnant. It is found, for instance, the urine of women taking cod-liver oil; and it is not lways to be found in women who are with child.

There are a great variety of miscellaneous evidences of regnancy, many of which are not constant enough to be of ny great value, unless they have occurred in former pregancies. Such are the different intellectual and moral pecuiarities which affect certain women. The countenance also ecomes much altered from absorption of fat; the eyes look omewhat sunken, and surrounded with a dark areola; the alæ f the nose are pinched; and the corners of the mouth dragged own, so that the mouth hence looks larger. The blood is aid to be buffy; but Dr. Montgomery suggests that this may e because those women who have been bled whilst pregnant ave been so bled on account of some inflammatory disease, nd he altogether denies that any indications of pregnancy can e derived from the blood. Dr. Garrod has stated that the roportion of fibrin is not increased in the blood of pregnant omen. Lecat mentions a woman whose face became black n three successive pregnancies, and Gardien relates other stances. Burns mentions discoloration of the skin as ot infrequent, and some women always have cutaneous ruptions during utero-gestation; others have dark spots deeloped upon the face. Dr. Simpson mentions ephelis as an ccasional concomitant of pregnancy. Intense pulsating occiital headache has been considered a sign of pregnancy by r. Beccaria, and hence called Beccaria's test. Pruritus is ith some women a very constant indication of the commenceent of pregnancy.

Jacquemin and Kluge called attention to a violet colour of e vagina and inner surface of the vulva, as an indication that e uterus was tenanted. Parent Duchatelet corroborates ese statements, and says the colour is never absent in pregncy. Pressure from any other cause, obstructing venous turn from the parts, would have the same effect. Hepatic disease, or pelvic tumours, or obstructed respiration, may be attended by a similar discoloration. Osiander attached some importance to the vaginal pulse, which may be felt somewhat increased in volume and force as pregnancy advances. The vaginal artery, he says, can be felt pulsating more rapidly than the radial when abortion is threatening?

CHAPTER IX.

DISORDERS OF PREGNANCY.

The special disorders of the pregnant state chiefly arise from reflex irritation of other organs by the uterus and its contents; from morbid conditions of the gravid uterus itself; from the effects of mechanical pressure and displacement; and from the influence of these causes, combined with the modifications of nutrition and excretion incidental to the development of the fœtus and the suspension of the catamenial function, upon the maternal vascular and nervous systems. In the production of many of the affections of pregnancy, all these causes more or less concur; and some of the prominent disorders are but the signs of pregnancy in an exaggerated form. Too much attention cannot be given by the student and practitioner to the diseases of the pregnant state, and to the prudent management of pregnancy. It is during gestation that the foundations are laid for some of the most dangerous affections of labour and the puerperal state. Pregnancy is the time for prophylactic measures, having reference to the safety of the mother and child in parturition. Conjunctures frequently occur, in which no amount of care and skill at the time of labour can make up for apparently trivial neglects during the course of gestation. This is the especial period when difficulties may be foreseen, and prevented or avoided. Nothing will contribute more to the reduction of the dangers and mortality of obstetric practice than a careful attention to the disorders of pregnancy.

Excessive Nausea + Vomiting.

Of the disorders depending upon reflex irritation, excessive Nausea and Vomiting are amongst the most troublesome to which the pregnant woman is liable. Sometimes the affection is bearable, the stomach returning certain kinds of ood, or being irritable only at particular times of the day, specially in the morning. In other cases, it continues to uch an extent that constant nausea distresses the patient, nd vomiting invariably follows upon every attempt to take nourishment, whether in the liquid or solid form. The epigastrium ecomes tender, and there is general fever, with great prostration and debility, as in idiopathic gastritis. An almost oisonous influence seems to be exerted by the gravid uterus n some constitutions. Such a state of things may go on for eeks or even months, and it is difficult to account for the ontinuance of life in some of these cases, except upon the upposition that a small quantity of food remains in the omach after each vomiting. It occasionally happens that ther circumstances besides the uterine irritation increase the ndency to vomiting: women, for instance, who have undertaken voyages during pregnancy, have died from the combined ffects of sea-sickness and the vomiting of pregnancy. A riend of my own lost a sister from this kind of vomiting, uring a voyage to Australia. I have known of two other milar instances, and such cases are not very uncommon. I ave seen the gastric irritation much aggravated by the occurrence of hooping-cough during the gravid state. In the orst cases, women who are not relieved, or who do not port, perish slowly from starvation, or they die from the upture of a bloodvessel, convulsions, or exhaustion, after olent and continued fits of vomiting. The matters vomited om the stomach consist of the food and drink swallowed, an cid, glairy or watery mucus, secreted by the stomach and ncreas, and, when the sickness is excessive, of bile which s ascended into the stomach by an antiperistaltic action, or blood from the rupture of vessels during the paroxysms of miting.

The first thing to be attended to, as regards treatment in e vomiting of pregnancy, is to attempt to get the secretions, rticularly those of the stomach and bowels, in as healthy a ate as possible. One of the most old-fashioned and serviceable remedies is the infusion of calumba with soda. The lumba and soda, with from three to five drop doses of the lute hydrocyanic acid, three times a day, is a very useful mbination. A grateful and sedative tonic is also made by ving citric acid with the calumba and soda, so as to form an ervescing draught. Cases are met with in which vomiting ords great relief, by getting rid of vicious gastric secretions,

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and contributing to restore the stomach to a healthy state; such patients should be puked occasionally with warm water, camomile tea, or a mustard emetic. In some patients, the stomach retains food after taking moderate doses of opium and morphia, and perhaps the solution of the bimeconate of morphia is one of the best forms in which an opiate can be given. Salicine, in doses of three to five grains, three times a day, is a valuable medicine, which was first mentioned to me by a medical practitioner. It allays sickness, and promotes appetite and digestion. Kreasote, in one or two drop doses, made into pills, with crumbs of bread, and given two or three times daily, is well known as an efficient remedy in this affection. Professor Simpson strongly recommends the salts of cerium, particularly the nitrate of cerium, in doses of one to two grains in water. Dr. Simpson has also used the vapour of laudanum as an inhalation with good effect. Sickness is sometimes relieved by the inhalation of a small quantity of chloroform. Where there is tenderness of the epigastrium, with fever, and an active state of the circulation, a few leeches may be applied to the pit of the stomach, or a small bleeding from the arm may be practised with good effect. Ice in the solid form, or iced drinks, often soothe the stomach of the gravid woman in a remarkable degree. Counter-irritation, in the shape of sinapisms, the turpentine stupe, or blistering, will sometimes afford great relief. In some cases, the stomach is soothed by the application of warm poultices sprinkled with laudanum, or a pledget of lint dipped in laudanum, the epigastrium having first been stimulated by a mustard plaster. The recumbent position, and perfect quiet, is of great use in the worst cases. It is sometimes necessary to treat not only the sickness, but also the Marasmus which is the result of excessive vomiting. A daily warm bath is a great comfort to such patients, and in cases of excessive prostration, gelatinous matter may be added to the bath, with a view to the endermic absorption of nutriment. Beef-tea injections, and the inunction of cod-liver oil, or sperm or salad oil, are very useful. I have seen a patient suffering from incessant vomiting, in a state of great anæmia, with œdema of the lower extremities from pure debility, kept up in the latter part of pregnancy mainly, as I believe, by the daily inunction of cod-liver oil over the abdominal surface. Pepsine, which I gave pretty extensively as early as 1841, and which is now coming into general use, is of great service in the apepsia of pregnancy. When all other means fail, and when exhaustion of the patient cannot be arrested, the last remedy is the emptying of the uterus, and this should never be delayed so long as to put the patient in a state of imminent peril. Nature herself often terminates the distress by spontaneous abortion. It has happened to me to have been twice consulted within a recent period in cases in which the induction of premature labour artificially was so long delayed, that the patient died before abortion could be induced. Paul Dubois has stated that he met with twenty fatal instances in thirteen years. It is a reproach to our Art that such cases should occur. The means of inducing abortion and premature labour will have to be discussed hereafter.

Anorexia, Indigestion, Heartburn, Gastralgia, and Variable Appetite, are caused in certain patients by the reflected irritation of the gravid uterus upon the stomach. Some women never feel so well as when they are pregnant, but in general, the appetite fails somewhat, and particular articles of food are regarded with aversion. A morbid desire for salted matters, acids, or alkalies, is not uncommon. Sometimes there is great loathing of every kind of food, or there is an extravagant desire to eat particular things, amounting to pica. These "longings," as they are termed, should be gratified as far as they reasonably can be. The common tendency of the appetite in pregnancy is to prefer fresh vegetables, fruits, and cooling drinks, and to avoid stimuli of all kinds. In this, the taste of pregnancy accords very well with its requirements. When the appetite is unnatural, the state of the bowels should be carefully regulated, and the patient kept as far as possible from taking things likely to be absolutely hurtful, as convulsions before and during labour are sometimes caused by the habit of indulging in improper and indigestible kinds of food. The remedies serviceable in excessive vomiting are also useful in the gastric disturbances now under consideration. Soda and magnesia are the best antacids in heartburn. In the neuralgic state of the stomach, which occasionally obtains, bismuth, hydrocyanic acid, kreasote, or an opiate plaster to the epigastrium, are useful. Sometimes small doses of acetic acid, or the mineral acids, will relieve the stomach in a remarkable manner; and when the neuralgia recurs at a particular hour of the day, it is generally relievable by quinine. In certain cases, uterine irritation excites the bowels to increased action, and tenesmus and diarrhœa are the results. In such cases, astringents should be given sparingly, unless

Anorexia

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the diarrhœa should be so considerable as to produce debility or lead to the risk of abortion. Care should, in the first instance, be taken to render the secretions as healthy as possible, and to avoid articles of diet likely to irritate the bowels. If necessary, the purging should be arrested by an opiate, with compound chalk mixture, bismuth, or gallic acid. When the diarrhœa depends, as it sometimes does, upon fæcal accumulation, or vicious secretions, a brisk purgative is the best remedy. In some patients the sickness is a secondary affection, depending on obstructed action of the liver, as evidenced by constipation or clay-coloured motions. In these cases an occasional dose of calomel or blue pill has a wonderful effect. Facial Neural. Facial Neuralgia from reflex uterine irritation is a very common affection of pregnancy. It generally affects the dental nerves, particularly those of the upper jaw. In many subjects, acute caries of the teeth occurs; and in some childbearing women a tooth or two is lost in each pregnancy. In neuralgia of the face, with or without disease of the teeth, a generous diet is called for, with wine and porter. Quinine and the lighter preparations of iron are very useful in such cases. Cold and damp, and residence near a river, or the neighbourhood of any large body of water, should be avoided as much as possible. Teeth ought only to be extracted with caution during pregnancy under such circumstances. The local application of chloroform, kreasote, camphorated spirit, nitric acid saturated with camphor, and other anodynes; scarification, or the application of a leech to the gum; are the best means of alleviating pain.

A painful state of the Mammæ sometimes occurs during pregnancy, but seldom requires anything more than frictions, with an anodyne liniment or warm fomentations. Occa- Mammitis sionally, however, acute Mammitis occurs from the irritation of pregnancy, requiring leeching and other active treatment to prevent suppuration. One of the most remarkable sympa- Goitre thetic disorders of pregnancy is the occurrence of Goitre to a slight extent. The treatment of this enlargement of the thyroid is not of much avail during gestation, and the goître generally disappears after parturition. Allied to this affection is the excessive Salivation which occasionally happens in pregnant women, leading to no serious results, and commonly requiring little further treatment than the use of an astringent wash to the mouth.

We shall have presently to consider the œdematous states of the lower extremities, depending upon pressure and debility; but there is another form of dropsy incidental to pregnancy, affecting not only the limbs, but the cellular tissue of the body generally: this is the Œdema Gravidarum of the older authors. No other cause than pressure on the vessels was, I believe, known for such a state of things until Dr. Lever pointed out its connexion with albuminuria. Other observers have added to this valuable advance in pathology, and it is now a well-recognised fact, that pregnant women, especially primipara, are often the subjects of Albuminuria, resulting in local and general dropsy, and involving, unless relieved, very grave dangers at the time of parturition. Albuminuria was first pointed out by Dr. Lever and Prof. Simpson in 1843, in connexion with puerperal convulsions; but since that date more attention has been paid to this condition, at the time of labour, than during its early stages in pregnancy. This is a misfortune, inasmuch as little can be done in such cases at the time of parturition; while, if detected early, the disorder can be relieved in the great majority of cases. It has been said that the disorder cannot be arrested during pregnancy; but I have never met with a case that resisted treatment, unless it had been neglected until towards the close of gestation. The cause of albuminuria in pregnancy has been considered to be the pressure of the gravid uterus. It has been found that ligatures applied to the renal veins will produce albuminuria artificially. Its prevalence in first pregnancies, when the abdominal walls are more tense than in multipara; in twin cases; in cases where the attempt is made to disguise pregnancy by tight dressing; and in subjects affected with dropsy of the amnion; and its rapid disappearance after labour, in most cases, seem to favour this view. Probably pressure on the kidneys is one cause of albuminuria; but I have seen it occur in primiparous women of relaxed habits as early as the fourth or fifth month, where the abdominal walls were flaccid, and no apparent pressure or tension existed. The disease appears to me in such cases to depend upon reflex irritation of the kidneys by the gravid uterus, similar to the irritation of the salivary glands, the mammæ, thyroid, &c., and not upon mere pressure alone. It certainly has not the same tendency to occur in ovarian dropsy, or in large fibrous tumours of the uterus, in which the pressure may be quite as great, and sometimes as rapidly induced, as in pregnancy. According to the researches of M. Blot and Prof. Litzmann, albuminuria is not

Œdema
Gravidarum
with
albuminuria

a very uncommon affection in pregnancy. M. Blot found it in about twenty per cent. of the women he examined, and Dr. Litzmann in a somewhat larger proportion. It is found, as already stated, more frequently in primipara than in multipara. Probably when the albumen is in small quantity, no special symptoms result. When the amount of albumen is excessive, and the disorder has proceeded without check, we have the legs enormously swollen, and the vulva and vagina become so tumid as to render an examination very difficult. There is puffiness of the face and hands, œdema of the abdominal walls, and almost every part of the body pits deeply upon pressure. The patient complains of headache, and sometimes dimness of sight and amaurosis. Lumbar pain is frequently present, and there is general pyrexia. The urine is small in quantity, and nearly solidifies upon the application of heat and nitric acid. It is generally of high specific gravity, loaded with phosphates, frequently alkaline in character, and containing epithelium or fibrinous casts of the tubuli uriniferi. Besides the loss of albumen, urea is retained in the blood, and appears to have been detected in this fluid as such by Dr. Lever. Other observers have failed to find urea. According to the view of Frerichs and Litzmann, urea becomes converted into ammonia, which has been found in the blood and in the secretions of the skin and lungs of albuminurious patients. As the poisoning of the circulation by urea and the loss of the albuminous portion of the blood proceeds, an intense degree of anæmia and pallor is induced. It is of great importance to relieve such a state of things before the coming on of labour, as albuminuria predisposes powerfully to convulsions and phrenitis, and, according to my experience, to dangerous hæmorrhage during and after labour. The treatment consists in small bleedings where ℞. there is distinct lumbar pain and general febrile excitement, or cupping upon the loins, or counter-irritation by sinapisms in the same situation. Warm baths and vapour baths are often very useful in restoring the function of the skin, removing the effused fluid, and disposing the kidneys to act. I have also found the use of diuretics, as the acetate of potash, oil of juniper, and infusion of broom, most useful. Frerichs and Litzmann have given benzoic and citric acids, with a view to remove the ammonia from the blood, and it is said with good effect. When there are no signs of renal inflammation or congestion, and the quantity of albumen has diminished, and that of the urine increased, a generous diet and the administration iron and tonics should be resorted to, in order to repair, as r as possible, the weak condition of the blood which has een produced. The detection and treatment of albuminuria pregnancy is one of the points of progress deserving the pecial notice of all engaged in the practice of midwifery. I ave no doubt the rate of obstetric mortality may be sensibly minished by attention to this subject. The urine should variably be tested for albumen in all cases of œdema of the tremities in pregnant women.

I am not aware that the matter has been observed by obste- ic authors, but in some pregnant women the urine, without ing albuminous, contains habitually a large quantity of triple osphates, is of high specific gravity, and has an alkaline action during the greater part of pregnancy. The nervous nd vascular erethism attendant upon, or produced by, the ate of pregnancy, is followed by the same results as other nd more marked causes of exhaustion. I have known this hosphatic Diathesis to exist in cases in which fatty degenera- on of the placenta has occurred in successive pregnancies. n one lady who had given birth to eight dead children at or ar the full time, this state of the urine was very marked. ie death of the children occurred before the end of gestation om placental disease, and was caused by the separation of c placenta before the occurrence of uterine action; or its tachment was so slight that it was separated by the first ntractions of the uterus; or the children were born in such weak condition, that they died soon after birth, leaving the tus to die of asphyxia. The treatment in such cases should that employed in the phosphatic diathesis occurring under her circumstances than pregnancy—namely, the mineral ids, opiates, rest, and a nutritious regimen. Such patients so require, either during or after the completion of pregnancy, eparations of steel, as a marked degree of anæmia is pro- uced by the persistence of the disorder.

Palpitation

Some gravid women experience great distress during preg- ncy from the sympathetic Irritation of the Heart, palpita- on occurring upon the slightest exertion or emotional dis- rbance; in others, the respiration is similarly affected, and ttacks of dyspnœa, approaching to asthma, harass the patient. iese affections are aggravated as pregnancy proceeds; and e effects of mechanical pressure upon the heart and lungs the ascent of the diaphragm, and upon the great vessels in e abdomen, become added to those of sympathetic irritation.

In such cases an opium or belladonna plaster over the heart, and the use of antispasmodics, such as sulphuric or chloric ether, valerian, musk, and similar remedies, are useful. Every means should also be taken to diminish, as far as possible, the effects of mechanical pressure. Cough is very troublesome in some cases. At the commencement of pregnancy, the cough may be spasmodic, and caused by sympathetic irritation of the throat and glottis; and, in the later months, by the upward pressure of the gravid uterus upon the diaphragm and lungs, a condition often accompanied by pleurodynia. In the former case, the cough is soothed by opiates and a good diet; in the latter, little can be done beyond obviating the effects of pressure as much as possible, by attention to the bowels, and the position of the patient. Such patients, for instance, require to sleep with their heads raised, and very great comfort is often obtained by the use of small air pillows, which can be shifted about with ease by the patient.

Headache.

Cephalalgia and Cerebral Irritation are sometimes produced by the irritation of the gravid uterus. They are, however, more frequently the secondary result of some other disorder incident to pregnancy. Thus, headache occurs as a symptom of albuminuria, constipation, anæmia, indigestion, &c. When it is caused directly by the condition of the uterus, it should be relieved by cooling applications, as ice or a spirit lotion, to the head, and a few leeches to the temples, small blisters behind the ears, aperients, &c. When headache is only a symptom of some other condition arising out of pregnancy, the treatment must be modified according to the particular disorder upon which it depends—as, for instance, a purgative in constipation; calomel in hepatic congestion; quinine or iron in anæmia; in albuminuria, the treatment adapted for the relief of this condition, and so forth. Severe headache is a symptom which should always attract the attention of the accoucheur, since we know that it may be the possible forerunner of puerperal convulsions or mania. It occasionally happens that actual Mania has been caused by the irritation of pregnancy, and apoplexy, epilepsy, and chorea have been met with. In these servere complications, the only efficient treatment consists in the artificial evacuation of the contents of the uterus.

Having referred to the principal forms of disorders dependent upon sympathetic nervous irritation, we come to the consideration of those caused chiefly by the direct pressure of

ie gravid uterus. Amongst the most obvious results of
ressure are the impediments to the circulation in the lower
xtremities. The weight upon the external iliac veins, par-
cularly in the upright position, very commonly causes a vari-
ose state of the veins of the legs. This condition is most
ggravated towards the end of pregnancy, and in women who
ave borne large families, or who have been obliged to exert
emselves during gestation. The varicose veins sometimes
flame at particular points, or throughout a considerable
xtent, and the walls of the veins may become thin and burst,
ving rise to dangerous hæmorrhage. In other cases, varicose
cers are formed by the inflammation and suppuration of a
atch of varicose veins. Certain inconveniences also arise as
e result of pressure on the internal iliac veins. In the
tter months of pregnancy, the distension of the internal
ac veins is caused by the pressure of the gravid uterus upon
e common iliacs; but in the early months, the pressure is
xerted directly upon the internal iliac vessels by the expand-
g uterus before it has yet emerged from the pelvis. In this
ay, hæmorrhoids, congestion, and varicosity of the vagina,
nd a varicose state of the vulva, are caused. In the latter
ondition, effusion of blood may take place from the veins into
e cellular tissue, constituting thrombus, which sometimes
tains a considerable size, and proves an impediment at the
me of labour. Generally the thrombus is confined to one
le, but Dr. Lever has mentioned a case to me of large
ouble thrombus, which I believe to be very rare. Hæmor-
oidal discharges are not uncommon in the early months of
egnancy from this cause, and, in some habits, blood is lost
om the hæmorrhoidal vessels for the first monthly period or
o after the commencement of pregnancy. Similar dis-
dered conditions of the pelvic veins may afterwards be
used by pressure upon the common iliac. Probably the
fects of pressure have some influence in causing a plethoric
ate of the uterus itself; but as the uterine veins empty
emselves partly into the internal iliac, and partly into the
ferior cava and renal veins, the early gravid uterus is to a
nsiderable extent defended against the consequences of
essure.

In the management of these conditions, as in all the dis-
rders of pregnancy, it must be remembered that, except in
e last resort, the cause of disorder cannot be removed, and
at we can only deal in palliative measures. The varicose

state of the veins of the lower extremities may be relieved by rest in the recumbent position, and by wearing a roller or an elastic stocking. In the event of a varicose vein bursting, the patient ought to be laid down, and placed with her legs raised above the level of the head until the bleeding has ceased, and pressure should be applied to the ruptured vein. The distension of the hæmorrhoidal and vaginal veins may be relieved by rest, and the avoidance of constipation; and if the veins of the vulva are varicosed, by the well-adapted pressure of an elastic bandage applied to the part.

The pressure of the gravid uterus upon the veins and lymphatics in the pelvis sometimes causes simple Œdema of the lower extremities, in cases where no disturbance is caused by venous pressure. At others, there is œdematous enlargement of the feet and ankles, combined with a varicose state of the veins. The œdema is aggravated by standing or walking, and becomes worse every evening, particularly as pregnancy advances. It is generally relieved by rest in the horizontal position, or, if painful, by an opiate embrocation. It disappears very soon after the occurrence of parturition. Cramp in the legs is a very troublesome affection to some pregnant women; and in subjects in whom it occurs during gestation, the disorder occasionally amounts to intense and continued agony during labour, affecting the muscles of the abdomen as well as those of the lower extremities. It depends partly on the pressure upon the lumbo-sacral nerves in the pelvis, and partly on the irritation of the gravid uterus, or constipated bowel, reflected upon the nerves of the lower extremities, apart from mere pressure. The tendency to cramp is increased by unusual exercise, long standing in the upright position, or by the omission of accustomed exercise. The treatment consists in friction and extension of the limbs during the paroxysm, and the avoidance, as far as possible, of the causes of this painful affection—that is, the bowels should be kept regular, and rest and exercise should be attended to in due moderation. Constipation is prone to occur in pregnancy, partly because of the mechanical pressure exerted on the rectum, and partly because the state of the gravid uterus acts as a contra-stimulant to the intestinal canal. Sulphur, bitartrate of potash, manna, or the lenitive electuary, should be given in cases of constipation, when the bowels are readily moved. In more obstinate cases, castor oil, or the compound rhubarb pill, or an injection of soap-and-water, are useful. There is a very common pre-

Cramp.

Constipation.

dice in favour of aloes, and this medicine is well suited to
ses in which the derivative influence of the gravid uterus
s reduced the rectum to a state of torpor. Its effects, how-
er, should be kept within certain limits, otherwise it is apt
excite the uterus. Magnesia should be avoided as a pur-
ative during pregnancy, and it should not be used to any
eat extent as a means of relieving heartburn, on account of
tendency to accumulate in the rectum. I have seen a
ry good imitation of sacral exostosis produced by the con-
ant taking of magnesia in pregnancy. Serious complications
ay occur at the time of labour, or subsequently, from neglect
the bowels, or from habitual constipation during the
egnant state. This is particularly the case with women
ho have required opiates during pregnancy, in whom accu-
ulations of fæcal matter in the colon are very apt to occur.
ere may be a daily partial action of the bowels in such
ses, but the bowels may become so loaded notwithstanding,
to complicate, favour, and tend to the production of inflam-
ation, fever, or convulsions after parturition.

Strangury, and incontinence of urine, are often met with in
egnancy: in the early months, from irritation of the bladder,
e irritation being partly caused by pressure, and partly re-
cted from the gravid uterus; and in the latter months,
iefly as the results of pressure. Little can be done in such
ses beyond enjoining rest, giving an opiate—particularly
hen the affection occurs in the early months—and taking
re that the urinary secretion is kept in as healthy a state as
ssible. The distension of the diaphragm and abdominal
uscles by the gravid uterus is occasionally the source of
vere pain in these muscles. This muscular pain may be felt
pecially in the diaphragm, in the situation of its insertion
to the ribs, in the course of the rectus, or in the bellies of
e oblique muscles. It is relieved by an occasional warm
th, the use of frictions with olive oil to the abdominal
rface, an anodyne embrocation, and especially by wearing a
itable bandage, so as to support the strained muscles. I
ve sometimes seen these pains, after bleeding and leeching
d been tried in vain, relieved at once by the use of a well-
justed bandage. Occasionally the skin is the seat of great
neasiness, from the distension of the abdomen, becoming
acked, and oozing out a watery secretion. The best relief
r this state is the use of oleaginous frictions, an occasional
arm bath, and the support of an abdominal bandage.

tion during Pregnancy — Battley's Sol. m 2 or 3 every 2 hours, or
Tr. Belladon. m 5 every 2 or 3 hours
in all the Neurotic affn of pregnancy.

CHAPTER X.

DISORDERS OF PREGNANCY (CONTINUED).

In the last chapter, reference was made to the disorders of pregnancy depending upon Reflex Irritation and Mechanical Pressure; and we now come to the consideration of Displacements of the Gravid Uterus, and their effects; a morbid state of the uterus and vagina.

Prolapsus
Procidentia

Conception may, and does occur in women suffering from Prolapsus or Procidentia, as in cases where the uterus is occasionally reposited, or returns of itself when the patient is in the recumbent position. Under such circumstances, there may be prolapsus or procidentia of the pregnant uterus in the early months. Harvey mentions a case of this kind. Unless abortion should happen while the uterus hangs externally, no other evils but the discomfort of such a state of things and the risk of abortion are usually experienced. After a while, the uterus no longer descends, the ovum acting as a very efficient intra-uterine pessary. All that is required in the way of treatment is the return of the uterus within the vagina by gentle pressure, and the continuance in the recumbent position for a time. Occasionally, however, where the uterus has formed adhesions, and abortion is caused, inflammation and pelvic abscess is the result.

In women who have borne many children, or who are of relaxed habits, or in whom large umbilical hernia exists, the uterus in the latter months of pregnancy hangs over the pubes, constituting Anteversion of the gravid uterus. Occasionally, in these cases, considerable disturbance of the bladder is experienced in consequence of the dragging and pressure exerted upon the neck of the organ. When the anteversion is considerable, the bladder is drawn upwards to a considerable extent; the unwieldy condition of the patient interferes very much with progression: and the loss of the proper axis of the uterus, and the impeded action of the abdominal muscles, become impediments to parturition. In these cases, the duration of labour is very apt to be prolonged beyond the usual term. In the first month or two of pregnancy, the natural position of the uterus is, as already mentioned, a

ight anteversion of the organ, as compared with the axis
eserved in the ungravid state, and the body of the organ
n be felt in front of the os uteri, and between the os and
e pubes. This generally produces no other inconvenience
ve that of pressure on the bladder; but when the antever-
on is very marked, as when a womb already anteverted
comes impregnated, or when large accumulations in the
ctum take place, the vesical irritation and disturbance be-
me more distressing. In the early months, in marked
ses, the patient should be a good deal on her back, and the
tum should be emptied daily by an enema or some mild
erient. The treatment of anteversion in the latter months
nsists of rest in the supine position, and the use of a proper
ndage.

By far the most formidable displacement to which the gravid
erus is liable is Retroversion — an affection noticed by
venter and some of the early obstetricians, but first ob-
ved distinctly by Gregoire, and fully described by William
nter and Denman. This affection occurs in its most decided
m at about the third or fourth month, when the uterus is
irely within the pelvis, and when it is of such large size
t any alteration from the natural position occasions great
onvenience to the neighbouring organs. It is usually de-
ibed as arising from excessive distension of the bladder,
ough neglect, reserve, or restraint on the part of the patient.
is believed that the full bladder, rising in the abdomen,
gs the neck of the uterus upwards, while the bulk of the
tended organ presses the fundus uteri backwards. The dis-
ced uterus, by the pressure it exerts upon the neck of the
dder, in turn increases the distension of this viscus, and the
overted uterus at length becomes fixed across the pelvis,
fundus lying in the hollow of the sacrum, and the os being
ed against the pubes, so as, in the worst cases, to render
evacuation of the rectum difficult, and the bladder im-
sible. This explanation of the matter, which has been
licitly followed by almost all writers on midwifery, was
rent, it should be observed, long before the subject of retro-
sion of the unimpregnated uterus came to be understood.
own observation inclines me to give a different view of the
le in which retroversion of the gravid uterus may occur—a
illustrated by a case which recently fell under my care.
dy, in whom the symptoms of retroversion of the uterus
existed for some years before her marriage, became preg-

nant, and the inconveniences from which she had suffered immediately became aggravated. I examined her, when she had been pregnant about ten weeks, and found the uterus completely retroverted. The fundus was almost pressing upon the perinæum, and the os uteri could be felt high up in front, behind the pubes. At this period there was no sensible pressure on the bladder; the organ could be readily emptied, and the urine was retained the ordinary time. It was upon the rectum that the pressure was chiefly felt. The uterus did not lie horizontally in the pelvis in the way usually described, but the organ was bent upon itself at the cervix, just as a retort is bent at its neck. As the case went on, and the uterus occupied the greater part of the pelvis, pressure on the bladder became painful, and I have little doubt the worst symptoms of retroversion would have occurred, had not care been taken to keep the bladder and rectum comparatively empty. The leverage of increased growth, aided by attention to the bladder and rectum, gradually raised the fundus uteri, and as the organ emerged from the pelvis it assumed the proper position. Probably, retroversion of the gravid uterus may be caused by an over-distended bladder, but I am sure that many cases of retroversion occur in the way I have described—from impregnation of the uterus already retroverted. I have met with other cases in which retroversion was detected before the occurrence of pregnancy, and when the symptoms were subsequently so severe as to produce abortion. At first, no great inconvenience is felt, but there comes a time when the os uteri presses on the bladder and prevents its evacuation. Then ensue the symptoms of retroversion, and that which has occurred slowly is looked upon as a sudden displacement. I have now seen numerous cases in which pregnancy has happened in patients suffering from retroversion, and sometimes retroversion has occurred in successive pregnancies in the same subject. It is believed that a pelvis above or below the average size, or narrower at the brim than at the outlet, may predispose to this affection.

The symptoms of retroversion, when the uterus is of such dimensions as to exert mechanical pressure upon the antero-posterior walls of the pelvis, are, in the first instance, partial or complete retention of the urine, pain in the pelvic region, and a sense of pressure on the rectum, giving rise to the constant desire for defæcation, even when the bowels are empty. Should these symptoms pass unrelieved, the bladder becomes normously distended, and it is sometimes ruptured mechani- ally, or its coats inflame and ulcerate, allowing the urine to scape into the peritoneal cavity, and the patient sinks, or ies of peritonitis. If the uterus cannot be replaced, and the water is occasionally and with difficulty drawn off, the bladder radually enlarges and elongates, and its mucous membrane ecomes diseased: muco-purulent, ammoniacal, or bloody urine s passed, and the kidneys may become diseased by the effects of he backward pressure of the urine. The structures between he bladder and uterus may become inflamed, and the patient e destroyed by irritative fever. In some cases all these ischiefs are averted or modified by the occurrence of spon- aneous abortion. In others the displacement continues to he fifth or sixth month, without destroying the patient, and has even been known to go on to the full term without ausing a fatal result.

As regards treatment, the first thing to be done is to obviate s far as possible the effects of pressure, by catheterizing the ladder and emptying the bowels by aperients or enemata. n some cases, these means, and directing the patient to empty e bladder frequently, and the bowels daily, are so efficient at no further inconvenience is felt, and the uterus rises into e abdomen as pregnancy advances. When the pressure annot be relieved by these means, an attempt should be ade to raise the fundus uteri mechanically. This should be one by introducing the forefinger of one hand into the vagina, nd the forefinger of the other into the rectum, when the os hould be drawn down with one finger or the uterine sound, nd the fundus elevated with the other. Naegele advises the ntroduction of the whole hand into the vagina for the pur- ose of lifting the fundus. In a difficult case, the efforts at position would no doubt be greatly assisted by the use of loroform. The most convenient position for the patient uring these manipulations is on her knees in bed, with her ead lowered. M. Gariel has proposed that one of his vul- anized india-rubber pessaries should be introduced into the ectum, or into the vagina, and that the fundus uteri should raised by inflating the pessary. I do not know if this plan s been tried, but the vaginal pessary might prove effective a case admitting of the mechanical re-adjustment of the terus. When the uterus was firmly wedged in, it might, owever, unless great caution were observed, lacerate the oft parts. If the symptoms are so serious as to threaten the safety of the mother, and the reduction of the retroversion cannot be effected, the uterus should, if possible, be emptied of its contents, by passing the uterine sound or a curved bougie into its cavity, and either rupturing the membranes, or detaching the ovum. We have seen that Nature herself sometimes gets rid of the difficulty by abortion. If the uterus cannot be emptied in this way, it should be punctured from the vagina or the rectum. These operations have been successfully performed, but they should, of course, only be resorted to in extreme and dangerous cases, and when there is no time for the induction of abortion.

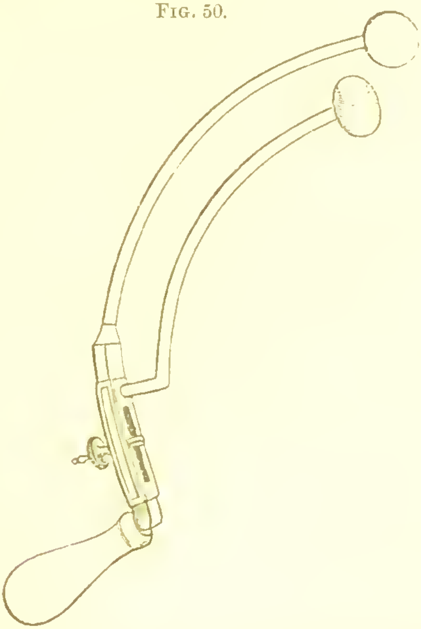
Dr. Henry Bond, of Philadelphia, has invented an instrument for the relief of retroversion, which Dr. Meigs states was successful in a difficult case, which had resisted other means. The following is the description of this instrument, as given by Dr. Meigs:—

"The instrument consists of two arcs of circles of different radii; the inner one is terminated by a small oval piece of ivory; the outer terminates in a small ivory ball. The exterior arc is formed at its lower extremity into a plate-piece, in which is a mortice; to the end of the plate-piece is attached an ivory handle, by which it may be conveniently held. The inner or smaller piece is attached to a sliding-piece, also morticed, and overlapping by its edges the morticed plate-piece, and secured by a clamp or pinch traversing the mortices, and fastened or loosened by turning the thumb-piece. If the thumb-piece be unscrewed, the clamp may be turned lengthwise, and the arcs are then easily separated. In order to use the instrument, the arcs should first be separated, and the ivory ball on the largest arc introduced into the rectum, while the oval one on the smaller arc should be introduced into the vagina. By sliding the smaller arc upwards, the two balls can be placed opposite to each other; or the vaginal arc can be set a quarter of an inch, a half inch, or an inch lower down than the one that is in the rectum. Upon being adjusted, and firmly secured by turning the thumb-piece, it is manifest that the two balls cannot be separated from each other, and that if they be moved upwards, parallel with the curve of the sacrum to the height of the promontorium, they must carry the retroverted uterus before them, and thus serve very effectually and easily to reposit the dislocated organ." (Fig. 50.)

The disorders of pregnancy depending upon the Uterus and

Vagina are, Uterine Plethora, Hysteralgia, a painful condition of the Round Ligaments, Pruritus, Sanguineous Discharges, and Leucorrhœa.

FIG. 50.



Uterine Plethora in the early part of pregnancy, as the joint result of pressure and the determination of blood to the uterus in the processes of nutrition, may exist to such an extent as to cause bearing-down, heat and pain in the back, and a sense of pelvic fulness, with inability to walk—symptoms which, if not relieved, are pretty sure to produce abortion. On examination per vaginam, the canal is found hot and dry; the uterus is swollen, low down in the vagina, and rigid and painful to the touch. This condition should be treated by the avoidance of intercourse, absolute rest, aperients of the gentlest kind, or mild enemata, the application of leeches to the perinæum or the inside of the thighs, cooling saline medicines, and a light unstimulating diet. When the uterine pain is considerable, an opiate, or hyoscyamus with camphor, should be given, or an opiate suppository should be introduced into the rectum.

Occasionally, in the middle and latter months of gestation the uterus itself becomes the seat of severe pain. If the organ be pressed upon with the hand, it is found to be painful, and the movements of the child and the contractions of the uterus itself are accompanied by much suffering. This kind of pain is accompanied by fever, a coated tongue, and high-coloured urine. It is generally considered to be of a rheumatic character, and admits of relief by a light diet, saline aperients, warm baths, Dover's powder, anodyne embrocations, and the liquor potassæ, with or without colchicum, according as the rheumatic element may appear to prevail. Some women feel this pain very distinctly in the direction of one or both round ligaments, and I have certainly seen several instances in which rheumatism has appeared to seize upon these ligaments during pregnancy—a circumstance very well explained by their fibrous structure. The treatment would be the same as in rheumatism of the uterus. In both cases every care should be taken to relieve the organ from all strain or pressure as far as possible, by rest and recumbency.

Pruritus is often met with in pregnancy, and in some women it is so constant as to be a source of much annoyance. It commonly depends on follicular irritation of the vulva, which, if unchecked, passes on to aphthous ulceration. Sometimes the vulva is quite free from irritation, and the itching is referred to the surface of the os uteri itself. In either situation, the pruritus is frequently accompanied by sexual excitement. In pruritus of the vulva the secretion from the surface is highly acid. The affection may sometimes be relieved by washing the part with common yellow soap, on account of the alkali it contains. Dilute hydrocyanic acid, Battley's solution, and carbonate of soda, make an excellent wash, in the proportion of one drachm of each of the two former to two drachms of the latter, in six ounces of water. Of this lotion, the patient should be directed not to use more than a tablespoonful at a time. A lotion of borax is often very useful. Occasionally, when alkaline applications fail, relief is obtained from an acidulated wash. Sometimes a lotion of tar-water is very soothing in this affection. If the disorder resists these measures, painting the vulva with a solution of the nitrate of silver, in the proportions of ten grains to an ounce of water, every day or every other day, or with the tincture of iodine mixed with an equal quantity of water, is an excellent remedy. In pruritic irritation of the os uteri, the solution of borax, or of the nitrate of silver, should be used as an injection; tepid or cold bathing, a cooling diet, and occasional aperients are necessary in such cases. It sometimes happens that the pruritis has a periodic character, coming on or becoming aggravated at particular times of the day. In these cases I have seen great benefit from the administration of quinine.

Leucorrhœa is a very common affection of pregnancy. The glands of the canal of the cervix share in the increased development of the uterus, and the secretion which forms the thick plug of mucus closing the cervix uteri is frequently in such excess as to cause a constant discharge. The secretion is thick, and perfectly white in colour, as it escapes from the os uteri. It is composed entirely of plasma and mucous particles, but in passing through the vagina it becomes mixed with the scaly epithelium of the vaginal surface. In some cases, the epithelial covering of the os uteri is abraded to a considerable extent, when muco-purulent or purulent matter is secreted from the abraded surface, and is discharged from the vagina with the mucus of the cervix. Sometimes, this abrasion exists before the occurrence of pregnancy, and is only aggravated by the afflux of blood and increased action natural to the gravid uterus. At other times, it originates during pregnancy itself. The subject of the abrasion of the os uteri in pregnancy has been investigated in France by MM. Boys de Loury and Costilhes, and by Dr. Henry Bennet and Dr. Whitehead in this country. The symptoms consist of purulent or muco-purulent vaginal discharge, pain and weight in the lumbar and hypogastric regions, all of which are increased by walking or sustained exertion of any kind. Examined by the speculum, the os uteri is seen denuded of epithelium to a greater or less extent, and secreting puriform matter.

I have ascertained that it is in such cases that the supposed menstruation of pregnancy frequently occurs. Occasionally large quantities of blood are lost from the abraded surface at each catamenial date. If allowed to pass without treatment, besides the debility induced by the constant puriform discharge, and the occasional loss of blood, there is some danger of abortion, or of painful and laborious labour at the full term. In cases of simply mucous leucorrhœa, little is required beyond the use of an astringent injection. In the severer forms of disorder, the treatment should consist of rest, keeping the bowels in a lax state, the use of injections of tannin, alum, the sulphate of zinc, or diacetate of lead, and the occasional local application of the solid nitrate of silver. The application of the nitrate should never be severe, and the employment of the more powerful escharotics must be avoided, lest they should cause abortion. As an astringent, the dilute sulphuric acid, with the compound infusion of roses, or the dilute muriatic acid, may be taken. By these means, severe cases of this kind are often cured. It must be confessed that abortion may, and does sometimes occur, from the treatment; and if the use of the nitrate of silver or astringent injections should cause much pain, they ought immediately to be disused.

The source of the blood in menstruation, or menorrhagia, during pregnancy, has often been the subject of discussion. Before the modern views respecting the formation of the decidua, it was difficult or impossible to account for the occurrence of a discharge having a menstrual character from the gravid uterus. How could a sanguineous flow issue from the cavity of the uterus when the whole of the internal surface of the organ was occupied by the decidua? Obstetricians were driven to suppose that the discharge must in such cases be poured out from the cervix, the os uteri, or the vagina. In accordance with the modern ideas respecting the development of the mucous membrane of the uterus into the decidua vera, Dr. Matthews Duncan has suggested that the menstrual discharge may be secreted from the decidual lining of the gravid uterus in the early months, before the decidua reflexa comes to be in apposition with the decidua vera in its whole extent. According to the view I have advanced respecting the loss and renovation of the mucous membrane at the menstrual periods, it is not difficult to conceive that in the first part of pregnancy the lower portion of the decidua vera may become broken down and thrown off with a sanguineous discharge. Probably, in cases of threatened abortion, in which there is a coloured discharge for several days or a more considerable period, without the loss of the ovum, the lower portion of the decidua vera is destroyed and formed anew. In several cases which have occurred to me, of menstruation during pregnancy, I have, however, found them, on examining with the speculum, to be cases of abrasion of the os uteri. In the intervals between the periods, the abrasions have secreted pus; but, under the influence of the vascular congestion which occurs at the menstrual dates throughout part or the whole of pregnancy, they exude blood after the manner of a menstrual ulcer. I met in the course of 1855 with two cases of this kind. One case I saw with Dr. Sibson and Mr. Whaley, of Kilburn, and in this the periodical menorrhagia was very violent, but it ceased as the abraded surface became healed. The other case, in which a molar pregnancy went on for several months with regular menstruation, the os uteri being abraded, I saw with Mr. Napper, of Cranley, Surrey.

Pregnant women are occasionally affected with symptoms similar to those met with in cases of Amenorrhœa. In certain constitutions, even while the physiological processes of gestation and lactation are going on, the absence of the stimulus of the catamenial function is felt, and general pallor, œdema of the lower extremities, with other signs or chlorotic anæmia, are the results. I have seen many well-marked cases of this kind. The subject has been slightly adverted to by M. Chailly, and more positively by M. Cazeau. The same thing may happen during lactation, and it is my opinion, that in many cases of anæmia in pregnancy, as well as lactation, the milder preparations of iron, as the ammonio-tartrate or ammonio-citrate, are called for, and should be given with a view to remedy the condition of anæmia. It is necessary to bear the tendency of the pregnant woman to anæmia in mind, as it forms a part of many of the other disorders of gestation. This state of anæmia is increased by the vomiting of pregnancy, and by several other disorders of the gravid state. In ordinary cases, the last thing we should do would be to give any preparation of iron, from the fear of inducing abortion; but when the anæmia is marked, the administration of steel tends to prevent the premature expulsion of the ovum.

The influence of pregnancy upon other diseases is an interesting subject. It is well known that blood drawn from healthy women during pregnancy generally shows the buffy coat, and it is found that all inflammatory diseases have a tendency to a more acute course than usual, and require a more prompt and active treatment than under any other circumstances. This is particularly the case in inflammatory disease of the chest. Certain diseases are more dangerous during pregnancy than at other times. Small-pox and Scarlatina are very fatal—especially the former—from the almost inevitable occurrence of abortion, and the unfavourable condition under which the patient is thus placed. Syphilis is not especially modified by pregnancy; but there is the twofold risk of abortion—from syphilis itself, and from the anti-syphilitic treatment required. There is this peculiarity in the relations of syphilis to pregnancy, that it offers, I believe, an instance in which secondary syphilis may be transmitted from one constitution to another without the intervention of a primary sore —that is to say, the germ cell receives from the sperm cell of a man labouring under secondary syphilis a dose of the poison, which is, in the first instance, developed in the ovum, and may afterwards be imparted to the mother through the medium of the placenta. Some patients suffering from Spasmodic Asthma are entirely free from the disorder during pregnancy. All affections of the Heart are aggravated by the pregnant state. The progress of Phthisis is often remarkably stayed by gestation; but, after labour, the disease generally goes on at an accelerated pace, and it is not uncommon for women in consumption to die within a few days after parturition. Cancer, when affecting the uterus, acquires a considerable impulse from the afflux of blood to the organ, and the development of the os and cervix uteri, in the latter months of gestation. Epilepsy is, in some cases, entirely arrested by pregnancy, and no puerperal convulsions occur at the time of delivery; in others, the character of the fits is not altered by pregnancy, or they become more violent and frequent, and there is a marked increase in their number at the time of parturition. These points I made out by a pretty extensive investigation a few years since, the results of which were published in *The Lancet*. The influence of gestation upon Mollities Osseum is very marked. This disease, which we shall have to refer to when treating of pelvic deformities, commonly increases with every pregnancy.

CHAPTER XI.

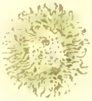
CAUSES OF ABORTION.

In the last two chapters, certain special disorders of pregnancy have been considered. We now come to treat of the particular malady to which the gravid woman is liable— namely, the premature loss of the Ovum. It will be seen that many of the other disorders of the pregnant state tend to this catastrophe, and require to be borne in mind in connexion with it. Abortion consists in the separation and expulsion of

e immature ovum from the uterus. The real adhesion be-
een the ovum and the mother is at the points of connexion
tween the chorion and decidua. At first, this connexion is
ght. William Hunter stated that, in the earlier part of
station, the chorion and decidua may, by delicate manipu-
ion, be separated from each other without laceration.
terwards, the intimate connexion between the chorion and
cidua, and the fusion of the two parts, and of the fœtal and
aternal vessels, in the placenta, renders the separation more
ficult, and the risk of abortion is consequently diminished
er the three or four first months of gestation have passed.

The older accoucheurs paid much attention to the real or
pposed loss of the ovum very shortly after impregnation.
arried women who passed over a monthly period by a few
ys, and then menstruated profusely, were believed to have
t an ovum. This was called an Effluxion, if it occurred
ore the tenth day, "because," as Smellie observes, "the
bryo and secundines are not then formed, and nothing but
liquid conception, or genitura, is discharged." In all pro-
bility, such cases are not uncommon, and the ovum is un-
erved—not from its liquid condition, but because it is so
le above the size of the unimpregnated ovule
not to be visible in the discharges. An ovum
fourteen days has been described by Velpeau,
its size did not exceed the adjoining diagram
g. 51.) In the expulsion of an ovum of an
lier date than this, the symptoms would hardly
er from those of profuse menstruation.

FIG. 51.



or practical purposes, Abortion may be defined as the
mature expulsion of the ovum at any time after the ovum
omes visible, and before the twenty-seventh or twenty-
ith week of pregnancy. Up to the latter date, the fœtus
ot viable; but after the completion of the sixth month, it
with care be reared. There are certain differences re-
ing notice in abortions occurring before and after the end
he second month, dependent on the different size of the
us, and the altered development of the vascular connexion
veen the uterus and the ovum before and after the forma-
of the placenta. The discharge of the ovum between the
of the second month and the twenty-eighth week, has in
equence been termed Miscarriage; but bearing in mind
peculiarities mentioned, it will be convenient in practice
onsider all expulsions of the ovum previous to the time

at which the fœtus becomes viable, under the head of Abortion.

This termination of pregnancy is exceedingly frequent. Of two thousand pregnant women who applied to the Manchester Lying-in Hospital, Dr. Whitehead ascertained that the collective number of their abortions had amounted to one thousand two hundred and twenty-two. Many of these were young women in their first pregnancies, or women who had not completed the child-bearing epoch. As regards the individual results, Dr. Whitehead found that, of these two thousand women, thirty-seven out of every one hundred mothers had aborted before they had reached the age of thirty years. The proportion of women who had lived in wedlock until the menstrual decline, to whom abortion occurred, approached to ninety per cent. There are, in fact, few women who have passed through the child-bearing epoch, and actually borne children, who have not aborted once or oftener. This is probably one of the subjects open to the greatest improvement in obstetric practice. Considering that at the last census the married female population of England and Wales, between the ages of fifteen and fifty-five, amounted to 2,553,894, the loss of fœtal life must be enormous. The date at which the majority of abortions occur is from the second to the fourth month of pregnancy. Taking the particular pregnancies in which abortion is most likely to happen, there seems to be greater danger of this accident in the first pregnancy, particularly amongst the upper classes, and in those later pregnancies which occur before the cessation of the menses.

We have seen, while considering the signs and disorders of pregnancy, that the uterus is in reflex relation with many important organs. These organs react upon the uterus, and prove in many cases the predisposing or active causes of abortion. In my work "On Parturition," I stated that I had seen abortion caused by irritation of the Mammary nerves, as when abortions occur during lactation from the irritation of constant suckling. That it is not mere weakness or exhaustion in some of these cases is proved by the facts that the mammary secretion may cease upon the occurrence of impregnation, but that a plentiful supply of milk returns after the occurrence of abortion. The contraction of the uterus after delivery, from irritation of the mammæ, is well known. When I first suggested this cause of abortion in some cases, the idea was somewhat roughly criticised; but it has been

pted in the recent work of Dr. Gunning Bedford, of New
rk, and Prof. Scanzoni has founded upon it a method of
ucing premature labour by irritation of the mammæ.

Irritation of the Gastric nerves will sometimes produce
rtion. It is astonishing what an amount of nausea and
niting the uterus will bear without being excited to expel
contents; and there is a belief, generally well founded,
t sickness prevents the occurrence of abortion from
idity of fibre or imperfect uterine devolution. But cases
occur in which abortion is apparently brought on, as a
lex pathological phenomenon, produced through the me-
m of incessant gastric irritation. Irritation of the Trifacial
ve may also produce abortion. This happens sometimes
m the irritation of cutting the wisdom teeth, the extraction
decayed tooth, or the irritation of constant odontalgia.
sical or Renal irritation, as from the presence of a stone in
bladder, or irritation of the kidneys in albuminuria, is
netimes the cause of abortion. Ovarian irritation has a
effect, as shown by the tendency to abortion at the cata-
mial dates, particularly in women who have been the sub-
ts of dysmenorrhœa. The production of abortion by the
tation of the Rectal nerves is a well-recognised occurrence.
may happen from hæmorrhoidal inflammation, the irritation
ascarides, the action of violent purgatives, diarrhœa, or
entery, or the opposite condition of excessive constipation.
mechanical effects of vomiting, coughing, sneezing, or
ining of any kind, will occasionally cause abortion in deli-
subjects.

rritation of the Uterus and Vagina may excite abortion.
gging the vagina is sometimes practised as a means of in-
ing abortion artificially. In abortion or premature labour
he later months, excited by violent horse or carriage exer-
, the accident depends upon the irritation of the uterus,
especially the os and cervix uteri, by the head of the
d, during the succussion which occurs. Coïtus, plugging
os uteri, disease of the os and cervix, procidentia, ante-
sion, and retroversion; the implantation of the placenta
r the os uteri, cancer, fibrous tumours of the uterus, me-
nical injuries and metritis,—may all cause abortion. In
rtion depending upon the disease or death of the ovum, it
he irritation of the uterus by its abnormal contents which
ctly excites the act of abortion. In the case of abortion
n the irritation of the uterus by the state of the rectum,

stomach, mammæ, &c., the action of the uterus is, in the first instance, purely excito-motor and reflex. When, however, the reflex action of the uterus is established, the peristaltic action of the organ combines with the reflex uterine action. In the case of abortion from local uterine irritation, or from the irritation of the uterus by a dead or diseased ovum, the reflex and peristaltic actions of the uterus are induced simultaneously.

We may consider abortion from reflex action as being, in some points of view, comparable with spasmodic asthma, or any other excito-motor disease. From certain irritating causes, an excitable condition of the excito-motor arcs concerned in parturition is induced. This state of excitability once produced, slight causes, which in healthy subjects would produce no disturbance whatever, are sufficient to produce morbid or spasmodic parturition. This excitability is not suddenly reached. It requires that the nervous arcs, whether mammary, rectal, or other, should be irritated for a considerable time, when an excitable, charged, or polar state of the uterine nervous system seems to be produced. The period preceding a case of reflex abortion may be likened to the time preceding an epileptic attack.

Certain agents have the power of exciting the uterus to contract, and are hence called Oxytocics. The oxytocic effects of the ergot of rye, cannabis Indica, savin, borax, galvanism, and the inhalation of carbonic acid, or its retention in the blood in asphyxia, are very generally believed in. Abortion has been often caused by the ergot of rye. During accidental or intentional poisoning by carbonic acid, the ovum has been found to be expelled. In the celebrated razzia in Algeria, conducted by the Duke of Malakoff, in which hundreds of Arab women were suffocated in the caverns of Dahra, many of those pregnant were found to have aborted. The same thing occurred in a similar exploit performed by the celebrated Chevalier Bayard. In other forms of death from asphyxia, as in drowning, sudden abortion has been known to occur. Many of the poisons, when taken by pregnant women in fatal doses, have caused, in the first instance, the loss of the ovum. Certainly pathological states excite contractions of the uterus, and are frequently the cause of abortion. Loss of blood; exhaustion, from whatever cause arising; the syphilitic poison; mercurialization; zymotic diseases—as small-pox, scarlatina, and fever; chorea; visceral inflammation; albu-

uria ; and, according to Lugol, the strumous diathesis—
excite the uterus to the premature expulsion of its con-
s. Emotion is another important cause of abortion. It
be produced by the emotions of fear, anger, grief, or any
r violent mental disturbance. Under the influence of
or and pain, martyred women have aborted at the stake.
expulsion of the ovum has sometimes occurred after
h. Of these oxytocic agencies, some affect the nervous
res, and are in this respect to be distinguished from the
entric or reflex causes of abortion. The ergot of rye, for
ance, passes into the blood, and affects the spinal centre,
g specially directed to the lower portion of the spinal
ow, and to that part of it in relation with the uterus. In
ase of emotion, the influence is distinct from other causes
bortion in being dynamic or psychical. Others, amongst
causes of abortion now enumerated, probably affect the
ition and life of the ovum, and in this way lead to
ion.

ne amount of disturbance to which some women may be
sed without inducing abortion is extraordinary. Mauriceau
es the case of a woman, in the seventh month of preg-
y, who fell from the window of a house, and, besides
sive bruises, broke one of the bones of the forearm and
cated the wrist, without aborting. Dr. Henry Davies
told me of the case of a woman, who, throwing some
r from a window, lost her balance and fell into the street,
ing both her thighs, but recovered without abortion.
Marshall Hall rendered a frog tetanic by strychnia at the
the oviduct was full of ova, and the ova were not ex-
l during the tetanoid symptoms, but some days after-
s, when the spasms had nearly disappeared. Dupuytren
s the case of a woman who had become the subject of
natic tetanus during pregnancy, but who, nevertheless,
ered and went her full time. Other women abort upon
lightest occasion. A habit of abortion appears to be
red in some cases, and abortions are repeated many times
ccession, without our being able to detect any very
us cause. I have known a woman abort ten times in
years; and another who in eight years had fourteen
ions, and gave birth to one still-born child. Madame
n mentions that she had ascertained by dissection, that
men who abort regularly, the uterus has sometimes con-
d adhesions to other organs. I have several times

known abortions to occur in women who had been the subjec of sloughing and cicatrization of the vagina, after previou labours, or who had been affected with pelvic cellulitis an pelvic abscess. In some women it appears as if the uteru could not be developed beyond a certain point.

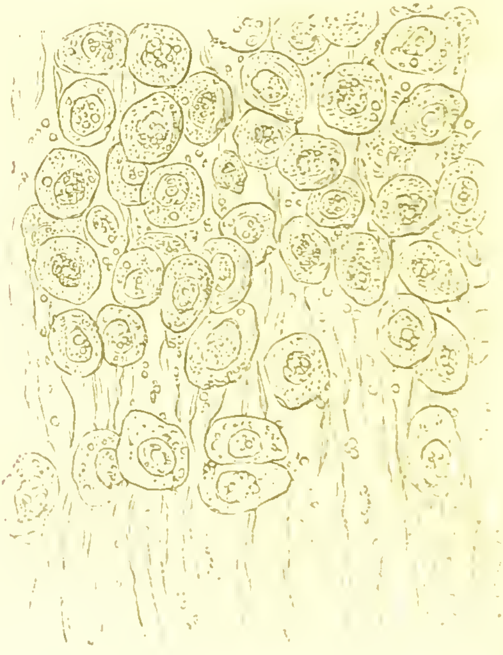
There is one other cause of abortion on the maternal sid which I believe to be of very great importance. In treating menstruation and the formation of the decidua, we have see that the mucous membrane of the uterus is concerned in t menstrual discharge, and that the decidua consists of the altere mucous membrane itself. Now, if this doctrine of the formation of the decidua be correct—and there is hardly matter within the limits of modern research, upon the subjec of generation, which seems better established—if this be tru I say, we must push the matter into the domain of patholog Dr. Simpson has done this in a very able manner in relatio to membranous dysmenorrhœa. Denman and others saw tha the mass discharged in these cases resembled the decidua, an made the comparison between the two substances. But D Simpson, after the true nature of the decidua had been ma out, was able to carry the comparison further, and he ha shown that the membrane discharged in membranous dysmenorrhœa is, like the decidua, the mucous membrane of t uterus itself hypertrophied, and exfoliated or thrown off at catamenial period. Many years ago I drew a comparison between menstruation and abortion and parturition. As regard the decidua, there is no great difference between an aborti a few weeks after conception and membranous dysmenorrhœa except that in abortion the decidua is loaded with the fruit the womb, and may be discharged more or less in a state disintegration. Every abortion really consists in the throwin off of the mucous membrane of the uterus and the ovum which has been developed upon its surface. I believe that, many cases of abortion, as in menstruation of healthy an morbid type, the disintegration and exfoliation of the developed mucous membrane, or decidua, is the first step the process, and the direct cause of the loss of the ovum From this point of view we must consider the show in case of abortion, and the continuous sanguineous discharge, a similar to the discharge in menstruation. In many cases happens that abortion is threatened, and there is a colour discharge for many days without the loss or injury of th im. In some of these cases, the discharge probably takes ce from the surface of the decidual mucous membrane, as gested by Dr. Matthews Duncan, in reference to menstrua- n during pregnancy. Abortion does not take place in such es, probably because the disintegration of the decidua does occur at the part at which the ovum or the placenta is lanted upon it, or not to a sufficient extent to injure it. abortion in the later periods of pregnancy, the comparison ween the loss of the ovum and menstruation holds good, w at this time the decidua serotina has become by far the st important part of the uterine mucous surface. In all es of abortion, this menstrual condition of the developed cous membrane of pregnancy plays an important part, and he chief cause of the sanguineous discharge; but in many es it is probably the actual cause of abortion. The ten- cy of abortion to occur at the catamenial dates has long n a matter of observation. In abortions occurring at the nstrual dates of pregnancy, the periodical influence of the ria, as well as of the uterine mucous membrane, must be idered.

We have now considered the principal causes of abortion rrible to the mother: others remain, in which disordered litions of the chorion and decidua, or of the maternal and al portions of the placenta, are concerned. There is also ther class of causes, in which the fœtus and its diseased litions tend to the production of abortion.

new cause of abortion, of great importance, affecting the ernal and fœtal structures of the ovum, has been made out in the last few years, chiefly by the original researches of Robert Barnes; I allude to Fatty Degeneration of the ion and placenta. Kilian had noticed a solitary case, but owe the first systematic account of the disease to Dr. nes, who was assisted in his microscopical investigation of subject by Dr. Hassall. This form of degeneration may t the secundines at any time between the early weeks of nancy and the termination of gestation. Fatty degene- n may exist in the placenta as a post-mortem change— is, it may occur in utero after the death of the fœtus. It happen also as the result of the transformation of effused ne in inflammatory disease of the placenta, or of a clot of d in hæmorrhagic effusion. Lastly, it may consist of the morphosis of portions of the maternal and fœtal structures of the placenta during the life of the fœtus. The latter pathological phenomenon is that which is of the chief importance in relation to abortion.

In a placenta affected with fatty degeneration the lobes of the placenta are altered in appearance, some of them being of a yellow, fatty colour, brittle, and exsanguine; the rest presenting their ordinary characters. Examined more minutely, the tufts are found to be glistening, hard, and tallowy, and not expanding when placed under water, as is the case with the villi of healthy placentæ. Under the microscope, the villi are seen to be studded with spherules and droplets of fatty matter and oil. The fatty material is found principally in the cells of the villi, and in the coats of the bloodvessels of the villi. When the fatty degeneration of the vessels exists to any

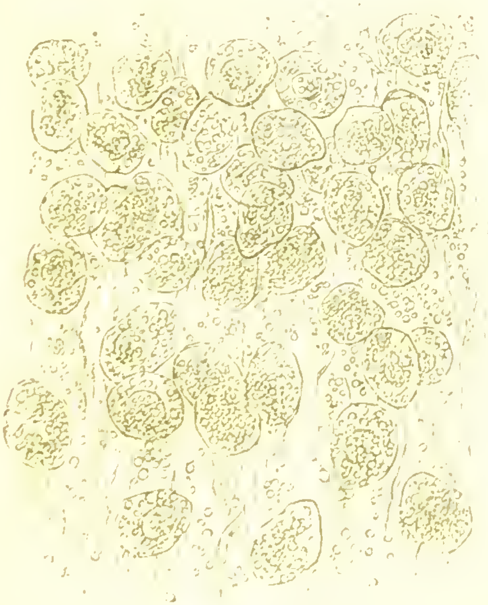
FIG. 52.



Cells of the decidua as they appear in the healthy placenta. 420 diameters.

tent, the vessels do not carry red globules. The villi and
e vascular loops affected with degeneration are knobbed and
isshapen in appearance. Dr. Barnes believes the degene-
tion or retrogressive metamorphosis, to commence mostly
the villi and decidual cells of the placenta. He has pointed
t that this state of things must materially interfere with the
tritive and circulatory functions of the placenta, and that if
proceed to any great extent, it must inevitably destroy the
tus by cutting off the connexion between the maternal and
tal circulations. Dr. Barnes supposes that, from the friable,
n-resilient condition of the degenerated lobes of the pla-
nta, partial separations must occur, leading to hæmorrhage
d abortion. He suggests also that partially degenerated
odvessels may burst, and occasionally lead to intra-placental
morrhage, or placental apoplexy. Sometimes the dead
um is at once expelled, at other times the chorion or placenta

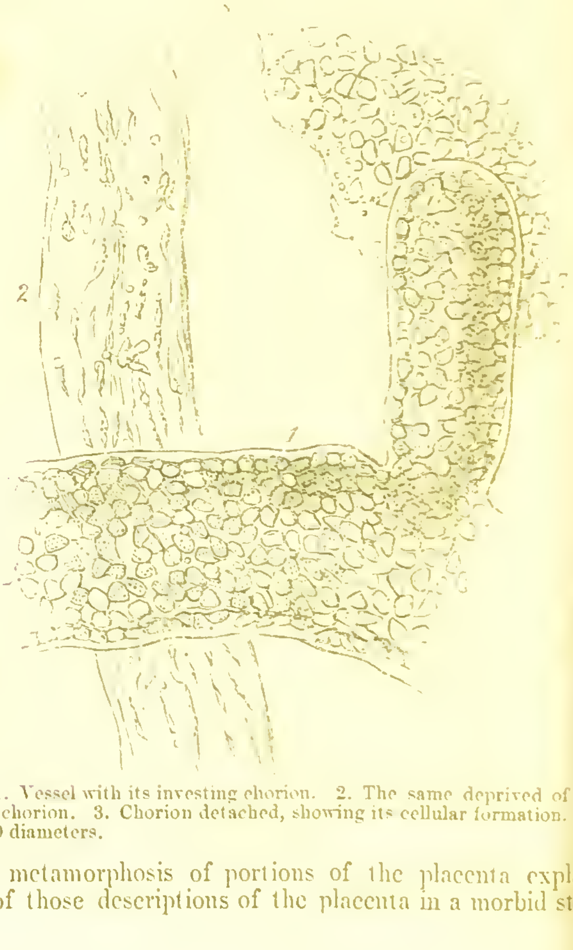
FIG. 53.



Cells of the decidua in a state of fatty degeneration.
120 diameters.

remains in connexion with the uterus, and undergoes a further metamorphosis, so as to consist very largely of fatty matter, before it is expelled. In all probability, many of those cases in which pregnancy repeatedly goes on in the same woman to the full time, and the fœtus is found to have died shortly before the time of birth, the cause of death will be found to be fatty degeneration. (Figs. 52-55.)

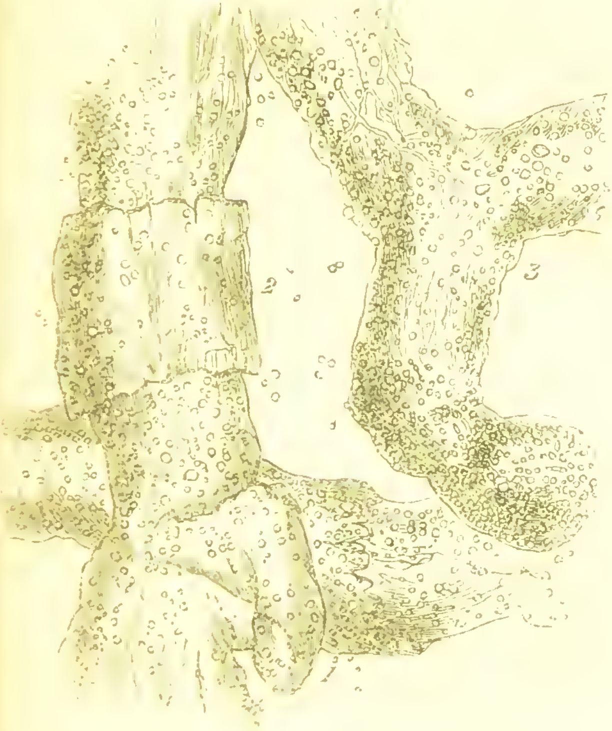
FIG. 54.



1. Vessel with its investing chorion. 2. The same deprived of its chorion. 3. Chorion detached, showing its cellular formation. 420 diameters.

The metamorphosis of portions of the placenta explain many of those descriptions of the placenta in a morbid stat found in obstetric authors before the subject of degeneration was understood. Many years ago I directed attention to the

FIG. 55.

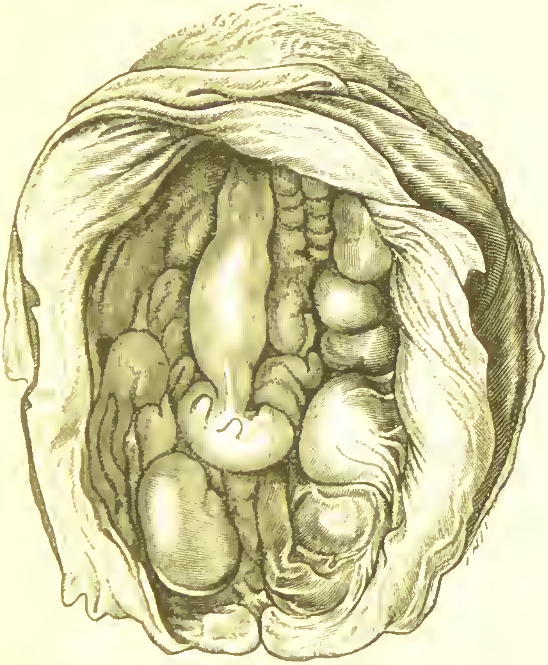


1 and 2. Branches partially deprived of chorion, and showing much fatty matter. 3. Bloodvessel entirely deprived of its chorion, and in a state of degeneration. 420 diameters.

egeneration of the placenta which precedes the date of parurition. Dr. Druitt has recently contended, that in the ormal placenta, at the full time, the signs of commencing atty degeneration are often present, and this is, no doubt, true; ut, under healthy conditions, the fatty metamorphosis cannot e extensive, otherwise the health of the fœtus could not be reserved. As regards the cause or origin of the fatty degeeration of the placenta, chorion, or decidua, Dr. Barnes refers it chiefly to an imperfect germinal or formative force on the side of the ovum. He is also of opinion that, dependent as the ovum is upon the vascular system of the mother for support, any imperfection in the nutriment supplied to it must contribute to the diseased state of the placenta. It is only upon this hypothesis that we can hope to control the malady, by rendering the system of the mother as healthy as possible during gestation. The later researches of Dr. Barnes lead him to believe that constitutional syphilis, maternal or paternal in origin, is a frequent cause of fatty placentæ.

The placenta is subject to congestion and inflammation and their results, and these affections are not unfrequently the causes of abortion. Congestion of the placenta leads to what is termed apoplectic effusion. Blood may be poured out either on the fœtal or external surface of the placenta; it may escape into the parenchyma of the organ; or it may be poured out on the maternal surface. (Fig. 56.) The loss of blood may lead to the death of the fœtus, and in this way produce abortion; or it may excite contraction of the uterus and separation of the ovum. In other cases, the blood effused coagulates, its fluid portions are removed, and a fibrinous mass remains without doing any great injury. In inflammation of the placenta, or Placentitis, effusion of lymph may occur, or the disease may pass on to hepatization, suppuration, or gangrene. Sometimes, when the inflammation affects the internal surface of the placenta, adhesions form between the placenta and the external surface of the ovum. In this way, the placenta has been found adherent to the forehead or body of the fœtus. Such is the probable explanation of a remarkable plate in Dr. Lee's illustrations of female pathology. This disease has been investigated by Brachet and Wilde, and one of the earliest and most elaborate memoirs of Prof. Simpson was chiefly devoted to this subject. Its symptoms are obscure, consisting of pain in the uterus, near the site of the placenta, pains in the back and thighs, and general fever. In cases where I have suspected placentitis, I have examined with the stethoscope, but have not found any modification of the uterine sounds. The causes of placentitis are not very obvious, beyond mechanical injuries, and the great afflux of blood to the organ, which occurs during pregnancy. Congestion and its results are probably common causes of abortion, though it is by no means certain that in all cases of abortion in which effused blood is found in the placenta, or the membranes, the ffusion has been the cause of abortion. In many cases, the ffusion occurs, without doubt, during the progress of abortion,

FIG. 56.

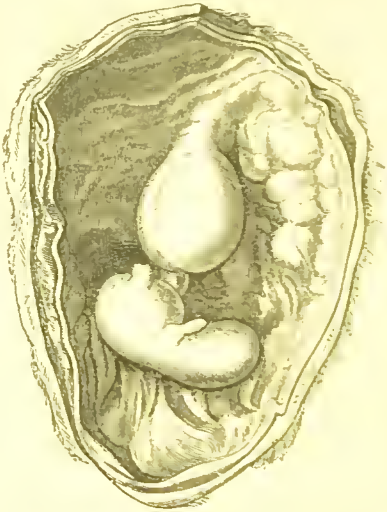


An apoplectic ovum: blood being effused in masses under the fœtal surface of the membranes.

om various causes. The treatment of placentitis and placental ngestion consists in local or general bloodletting, according to amount of pain and the constitution of the patient, counter-itation over the uterus, and other means for equalizing the culation. Dr. Simpson is of opinion, that many of the es of repeated abortion, in the same person, depend upon cental congestion. The placenta is liable to other diseases, iich have a tendency to repetition, such as calcareous degeration, tubercular deposits, and atrophy or hypertrophy. In case of a syphilitic ovum leading to abortion, the placenta very commonly diseased.

When from any cause, the fœtus dies, the circulation in the fœtal portion of the placenta is suspended; this in turn affects the circulation on the maternal side; the ovum becomes a foreign body, and abortion generally takes place. Sometimes, however, the placenta is still nourished imperfectly, and the dead ovum is retained *in utero* for a variable time. The fœtus is liable to many diseases which may lead to the death of the ovum, such as inflammation of its serous membranes, dropsies of the serous cavities, or the amnion, disease of the liver or kidneys, tubercular disease, diseases of the umbilical cord, knots upon the cord, twisting of the cord tightly round the neck of the child, and various other affections which are sufficient to destroy its vitality. (Fig. 57.) I have seen a case, in which the head was nearly amputated by the twisting of the cord round the neck. Probably a diseased ovum excites the uterus to expulsive contractions in many cases, before actual death of the ovum has occurred.

FIG. 57.



Ovum showing morbid enlargement of the umbilical cord.

CHAPTER XII.

TREATMENT OF ABORTION.

AMONG the first symptoms of abortion are sanguineous discharge, and the occurrence of lumbar, hypogastric, and coxal pain. The pains which precede abortion are very much like those which precede or accompany a catamenial period. Some women abort, however, without having suffered much, if any, pain. It frequently happens that a distinct rigor, or frequent shiverings, usher in abortion. There is sometimes diarrhœa, and, still oftener, an irritable condition of the bladder. Coldness of the breast and abdomen is sometimes complained of, and there is often a cessation of sickness, where this has been troublesome. On being called to a case of supposed abortion, an examination should always be proposed, and made, if possible. It may happen that in cases of supposed abortion there may be no pregnancy at all. Great care should be taken, in digital examinations, not to give pain nor use any violence, lest the tendency to expulsion of the ovum should be increased. In threatened abortion, the os and cervix uteri will generally be found open to some extent, and the body of the uterus may be felt in front of the os, but lower in the pelvis than natural, and hard, as if firmly contracted. When abortion is actively proceeding, the ovum, or part of the ovum, may sometimes be felt high up in the cervical canal, or it may be partly extruded from the os uteri.

The first consideration, in a case in which the symptoms of threatened abortion have occurred, is whether or not the ovum can be preserved. With this end in view, all irritations of a reflex kind should be avoided, or removed, as much as possible. General, local, or vascular excitement should be treated by a soothing regimen and diet. It is rare that cases are met with requiring general bloodletting; but leeching is sometimes useful in cases of uterine plethora, particularly when the symptoms occur at what would, in the absence of pregnancy, have been a catamenial date. The leeches should be applied to the inside of the thighs, or the perinæum. When nervous excitement predominates, a full opiate is of great service. Opiates, in full doses, are also especially called for when there is intermittent uterine pain, or the continued pain of the back and lower part of the body similar to painful menstruation. Dr. Fleetwood Churchill has given the cannabis Indica with good effect as an anodyne, and with a view to its restraining sanguineous discharge. In the earliest abortions, astringents are very valuable, the loss of blood in such cases very much resembling menorrhagia. The acetate of lead, in combination with opium, the mineral acids, the oxide of silver, alum, gallic acid, are the best remedies of this kind. If the discharge is profuse, iced drinks should be given. Otherwise, the beverages of the patient should be cool, without being absolutely cold, in order to avoid uterine contraction. In the treatment of abortion, it must always be borne in mind, that in diet and medicine any agents which excite contraction of the uterus may arrest hæmorrhage for the moment, but with the danger of exciting further separation of the ovum. We must be careful, therefore, not to excite any powerful uterine action. The local application of cold to the vulva, and the introduction of sponge, or pieces of lint, dipped in water, into the vagina, are very useful, within certain limits; but it must be remembered that excessive cold excites uterine contractions, and so, also, does the sponge or linen plug, if it should be large enough to irritate the vagina mechanically. Perhaps the most important of all the means at our disposal for the arrest of abortion, is rest, in the horizontal position. The patient should be kept in bed in a cool apartment, lightly covered with clothes, as long as any coloured discharge continues, and for some days afterwards she should be kept upon a couch, and not allowed to assume the upright position or to walk. When the uterus is in the irritable and congested condition which accompanies abortion, the standing posture, or considerable movement of any kind, greatly adds to the probabilities of abortion. The mind of the patient should be kept as quiet as possible, and all exciting or alarming intelligence withheld from her. The bowels should be regulated, if necessary, with the mildest laxatives. I prefer the senna confection, with a little bitartrate of potash, as an aperient. Castor oil, in my experience, irritates the uterus and mammæ, and should not be given. When the threatening of abortion has occurred at a catamenial date, every precaution should be taken, as the next monthly period comes round, in the way of avoiding irritation, and preserving quiet of body and mind. Every pregnant woman should be told to take note of the catamenial dates roughout pregnancy, and observe greater care than usual these times, particularly if she has been the subject of ortion. The attempts to prevent abortion should be carried t perseveringly, as it sometimes happens that women suffer m the symptoms of abortion for a considerable time, slight guineous discharges lasting for weeks, and yet, with con- ual care, they go on to the full term. It sometimes occurs t the bleeding is very profuse, and the os uteri so closed t the finger cannot possibly be introduced into the rus. All the more powerful astringents may have been d in vain. In such cases the vagina must be plugged nly with lint or sponge, or, which is still better, in extreme es, by an air-pessary. These means arrest the bleeding nost invariably, and tend to promote coagulation at the uths of the bleeding vessels. If, however, it is necessary continue the plugging for any length of time, the uterus omes excited by the mechanical irritation, and throws off contents. Sometimes the loss of blood is so great as to uire the free administration of brandy, ammonia, and other mulants. As abortions frequently spread over a considerable e, every care should be taken to support the strength of patient. In abortions at the fourth or fifth month, the norrhage may be so profuse and sudden as to be alarming n the first. This is particularly the case in abortions urring about the time of the cessation of the catamenia. such cases, if the hæmorrhage cannot at once be arrested stringents, cold, and the tampon, the membranes should be tured with a view to stop the hæmorrhage, and to excite ulsive action of the uterus.

Vhen an abortion is threatened, the accoucheur should er all the discharges to be saved for his examination. Every , and every portion of solid matter should be carefully in- cted. Otherwise it may happen that the patient or her se shall tell you she has aborted when she has not done so, gula having been mistaken for the ovum. Or it may occur the ovum having passed unnoticed, and slight or profuse orrhage continuing, as it sometimes does, for a consider- time, the accoucheur is puzzled by expecting an abortion after it has been actually accomplished. In connexion these points, it must be borne in mind that cases occur hich the ovum appears to be dissolved, and slowly dis- rged with sanguineous matters, just as the decidua is dis- rged in the lochia after parturition. A delicate ovum of a few weeks may disappear within the uterus, as occurs in certain cases of molar gestation, and the membranes may be broken down and discharged in the form of detritus. Either of these three cases may prove very embarrassing to the practitioner. Whatever care may be observed, cases will occasionally occur in which women who have passed two or three menstrual periods, and exhibited the signs of early pregnancy, will be seized with the symptoms of abortion, and suffer from a sanguineous discharge for a considerable time, without passing any detectable portions of an ovum. After this the patients may menstruate regularly, and it becomes exceedingly difficult, or indeed impossible, to decide whether they have aborted or suffered from a temporary suppression only.

The indications which should make us abandon all hope or intention of saving the ovum are, sudden losses of blood to an extent which imperils the health of the mother, or such a continuous drain as seriously to endanger her life; it being also nearly certain that in such cases the ovum is diseased or already dead. If, on examination, we can feel the ovum at the os uteri, or in the cervix uteri within reach of the finger, we may be certain that its expulsion is only a question of time. As a rule, there is little hope of saving the ovum after the rupture of the membranes and the discharge of the liquor amnii. I have, however, seen more than one case in which gestation went on to the full term after the discharge of the liquor amnii in the early months. Fœtid discharges, particularly in early abortions, are a pretty sure sign of the death of the ovum.

When all expectation of saving the ovum has been abandoned, means should be taken to obtain its removal from the uterus. If the bag of the early ovum can be felt with the finger in the cervix uteri, it can generally, by careful manipulation, be separated from the uterus, and got away by the finger alone. Sometimes it is necessary to introduce the hand into the vagina, in order to get the finger into the uterus; and if the hæmorrhage is alarming, the case urgent, and the os uteri sufficiently dilated to admit the finger, there need be no hesitation in adopting this measure. I have never seen any ill effects arise from such an introduction of the hand and finger. When the os uteri is undilated, and the hæmorrhage is great, Dr. Simpson recommends the introduction of one of his sponge pessaries, with a view to the mechanical dilatation of the os and cervix. The only precaution necessary in such cases, as in all instances in which sponge is used in the vagina, is not to allow the sponge to remain long enough to become fœtid. The ergot of rye, and the cannabis Indica, may be given for their oxytocic effects in cases where it is thought unadvisable to remove the ovum, or portions of the ovum, mechanically. Galvanism has been suggested by Dr. Robert Barnes, and from what I have seen of its action in cases of intra-uterine polypi I have no doubt it would contribute to expel an ovum in a difficult case of abortion. We may turn the reflex connexion between the rectum and the uterus to great account in the treatment of abortion when there is no hope of saving the ovum. A drastic cathartic enema will often complete the expulsion of an ovum in the most rapid manner. Various instruments have been proposed and recommended for the mechanical extraction of a partially-detached ovum. There is, however, no instrument equal to one or two fingers when they can be introduced. The last invention of this kind is an instrument proposed by Dr. Fleetwood Churchill, on the principle of the familiar apparatus for getting a cork from the inside of a bottle. In France, a small forceps, somewhat resembling the lithotomy forceps, is used for the same purpose. Dewees invented a wire crotchet for the extraction of the ovum. It must be said, however, that, with all instrumental devices for the removal of the embryo, there is danger of injuring the uterus, and with the hand in the vagina, a case can hardly occur in which the embryo and membranes, or portions of the latter, when retained, cannot be detached and brought away by the finger. Time and patience are sometimes necessary for this manipulation, but I have never known it fail.

I have seen cases where it was necessary to give chloroform before introducing the hand to get away the membranes or placenta. In a case I saw with Mr. Ballard, of a retained placenta in an abortion at the fifth or sixth month, no other means would have enabled us to extract the remains of the ovum. The ordinary modes of procuring its removal had been tried in vain. The patient was in such a state of frenzied excitement that any introduction of the hand would have been impossible while she remained conscious. The cord had broken, the placenta had been retained thirty-six hours, and there was no choice but that of leaving the placenta or giving chloroform. There was no difficulty after this in introducing the hand, but the placenta had to be peeled from the surface of the uterus. The dangers of retained placenta are well known, and in cases of difficulty I should not hesitate to advise the use of chloroform for its removal.

The condition in which the ovum is expelled varies greatly in different cases. The most favourable way in which an early abortion can occur is where the detachment of the entire ovum takes place, before the act of expulsion occurs. The perfect ovum is then expelled at once, and the uterus contracts without much hæmorrhage. In other cases, the membranes are ruptured, and the small fœtus comes out alone, or enveloped in the amnion; or the decidua and membranes may be discharged piecemeal, leaving the fœtus to escape afterwards. As a general rule, the membranes remain after the expulsion of the fœtus; and the earlier the abortion, the longer the membranes or placenta have a tendency to remain. This is probably owing to the firm adhesion of the thick decidua vera to the internal superficies of the uterus, and the feeble power of the uterus to contract on its contents. Sometimes the membranes of an early ovum will remain for weeks, but in such circumstances there is not the same tendency to decomposition and its dangers, as there is in the case of the placenta at the full term. In some cases, the ovum, enveloped in the amnion and decidua reflexa, in the shape of a perfect bag, is expelled in the early months, and a careless observer would say that the abortion was completed, but after this the thick decidua vera has to be discharged. Sometimes this is expelled entire, as a mould of the uterus, at others it comes away in thick pieces, or it may be broken down and expelled, so as to elude detection.

The mechanism of abortion varies considerably, according to the time between conception and the term of natural labour at which the accident happens. No doubt abortion may occur in cases where conception has taken place just before a period, when the motor act of expulsion would probably be limited to the Fallopian tubes, the ovum being carried out of the uterus with the menstrual discharge. In cases occurring in the early months, the canal of the cervix and the os uteri have to be dilated before the ovum can pass, and this process of dilatation occupies a considerable time, frequently causing much suffering. When the dilatation has occurred, the ovum is expelled by the contractions of the imperfectly developed uterus. These contractions occur periodically, and are accompanied by periodical pains, as in labour at ie full term. The nearer the time at which the abortion ikes place, is to the time of labour, the more closely do the ains and the motor action and mechanism resemble those of atural parturition. In abortions occurring after the forma- on of the placenta, the tendency, as regards the expulsion of ie ovum, is to imitate labour at the full term. The cervix teri is slowly dilated, the membranes ruptured, and the fœtus xpelled, to be followed, at a longer or shorter interval, by the embranes and placenta. In the early months, the difficulty ccurs, not in the passage of the fœtus through the pelvis, ut in the dilatation of the undeveloped cervical canal. As station advances, and the cervix uteri becomes developed, ie difficulty of passing through the cervix becomes dimi- shed, while that of passing through the pelvis is increased. hen the ovum is small, the contractions of the uterus are iefly or solely concerned in its expulsion; but when it is rge enough to distend the vagina, the abdominal and respira- ry efforts are called into play.

Usually, an abortion is not attended by any great danger. omen recover rapidly from the loss of an ovum, and there is remarkable aptitude for conception afterwards. They do, wever, sometimes perish from loss of blood, convulsions, or pture of the uterus. They are also liable to the dangerous ad fatal affections which attend the puerperal state. Tetanus, sembling the traumatic disease in character, has been known occur after miscarriage, and in rare cases blood has passed rough the Fallopian tubes into the peritoneum, causing ath by peritonitis. Abortion occurring from small-pox and arlatina is especially dangerous to the mother. When omen abort frequently, great damage is done to the general alth; a profound anæmia is caused; and patients may die secondary diseases arising out of the debility induced by urrent miscarriages. When the whole of the ovum has en expelled, it is rare to meet with any profuse post-partum morrhage. The uterus is at once so diminished in size as prevent the risk of bleeding. It happens, however, that casionally small portions of the membranes are left *in utero*, d are a source of irritation and bleeding for weeks after the s of the ovum. When the entire ovum is extruded, or ought away completely in detached portions, the woman is once in a state of ease and safety. A discharge, similar to lochia, generally continues for some days. As regards st and other management, a patient, after a severe abortion, should be cared for in the same way as a woman who has been delivered at the full term—that is, she should be kept in bed, and ordered a light unstimulating diet, until she has regained her strength. The breasts are sometimes stiff and painful, but rarely give much trouble after abortion.

We must take cognizance of diseased states of the placenta in the treatment and prevention of abortion. When the fœtus is threatened with death because the placenta does not act sufficiently as an organ of nutrition and respiration, we may, through the mother, act upon the placenta, and assist it in the performance of its functions. Dr. Power prescribed the inhalation of air containing an increased quantity of oxygen, or the use of medicines containing a large proportion of oxygen in a loose state of combination, as nitric acid, in cases where the child has been lost repeatedly in the latter months of pregnancy. Dr. Simpson states that he has found chlorate of potash useful in cases where the fœtal respiration is imperfect. Every care should be taken in such cases to keep the blood of the mother in a healthy state. It is evident that the sanitary condition of the fœtus must mainly depend on the condition of the arterial blood of the mother, this being the medium in which the embryo respires. It has been recommended that, in cases of repeated peritonitis or cerebral disease in the fœtuses of the same mother, mercurialization and other means should be employed with the view of reaching the ovum through the maternal circulation; but, in the present state of our knowledge, the means of diagnosis in diseases of the fœtus are too obscure to render therapeutics of much value. In syphilis affecting the mother, or when the father is syphilitic, there can be no question of the propriety of mild mercurialization as a means of warding off the dangers of abortion, regard being had to the fact, that the careless use of mercury may itself be the cause of abortion. In the prevention of abortion from fatty degeneration of the placenta; the strength of the mother should be supported in every way. The chlorate of potash, nitric acid, mild preparations of iron, and, above all, fresh air, should be recommended. The treatment of fatty placenta should be the same as fatty heart, or fatty degeneration of any other organ.

The Prevention of abortion is an important subject. The whole of the treatment of the disorders of pregnancy has a direct bearing upon this subject. In women who abort from habit, when the nervous system is chiefly concerned in the production of the accident, all emotional disturbance and reflex sources of irritation should be avoided as far as possible. The pregnant woman should not suckle, or be subjected to any mammary irritation. Mr. Lloyd has related a case in which a small tumour having been removed from the breast of a pregnant woman, she aborted, and died of metritis. Irritation of the dental nerves should be guarded against. The rectum should be remembered, not merely as a neighbour to the uterus, but as possessing an excitor surface in reflex relation with the uterus. Ovario-uterine and vaginal irritation should be soothed, and excitement avoided, particularly at the catamenial dates. It is a useful point in the Periodoscope I constructed some years ago, and some thousands of which have been used by the profession, that it points out, at a glance, the catamenial dates of any pregnancy. The late Dr. Griffin, of Limerick, recommended large doses of quinine in the case of women who abort repeatedly at the same date of pregnancy. Mr. White, of Manchester, recommended cold or tepid bathing, with success, as a preventive of abortion. Some accoucheurs advise a daily enema of cold water, in women of weak, irritable habit. When the tendency to abort is very strong, nothing is so likely to prolong gestation to the full term as absolute rest in the horizontal position. When all other means fail, an attempt should be made to eradicate the abortive diathesis by a year's marital separation, and a tonic treatment in the meantime.

CHAPTER XIII.

MOLAR PREGNANCY.—BLIGHTED OVA.

Certain matters are occasionally discharged from the virgin or unimpregnated female, which it becomes necessary to distinguish from the genuine results of fecundation. These consist of masses of squamous epithelium from the vagina; fibrinous collections from the cavity of the uterus; and the membranous product expelled in some cases of dysmenorrhœa. There can be no difficulty in recognising the flakes or tubular pieces of squamous epithelium, exfoliated from the vagina.

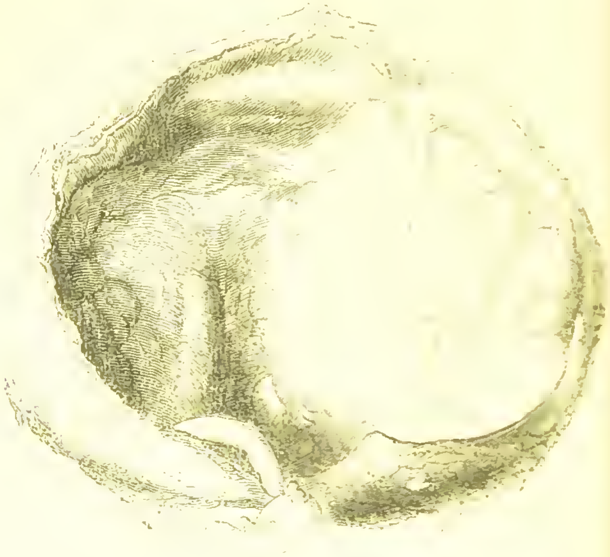
The fibrinous masses expelled from the uterus resemble an almond in size and shape, being to some extent casts of the uterus; they are smooth externally, and possess a very imperfect central cavity. The dysmenorrhœal product consists of the uterine mucous membrane, exfoliated in a more or less perfect form. When entire, it has the shape of the cavity of the body of the uterus, is rough externally, and smooth within, having a distinct triangular cavity, when discharged from the nulliparous uterus, with two openings above, and one below, at the sites of the Fallopian tubes and the canal of the cervix uteri. In the case of the multiparous organ, the dysmenorrhœal bag is ovoid in shape. There are, of course, no traces of funis, membrane, or fœtus. More frequently, the membrane is thrown off in detached portions. Examined microscopically, the squamous epithelial masses consist of quantities of epithelial scales. The fibrinous masses are composed of filaments of fibroid material arranged in bands, and myriads of granular corpuscles, similar to exudation corpuscles. In the true dysmenorrhœal membrane, the convoluted utricular glands are found, with their openings on the smooth internal lining of the cavity, and the cæcal extremities of the glands upon the rough or external surface. The older writers included polypi and fibrous tumours in the list of moles; but the above constitute what are now considered as False or Spurious Moles.

The Genuine Moles, which are the result of impregnation, are of various kinds, consisting of different forms of degeneration of the membranes of the ovum. We can readily distinguish the varieties of mole depending on the carneous or fleshy, the hydatiginous, and the fatty and other degenerations of the membranes. None of these cases can occur without conception. Formerly great confusion prevailed upon this subject. Many authors believed that fleshy moles might occur in nuns and others presumed to be virgins, without the occurrence of intercourse. Percy believed that hydatids were independent animals, and that their production was compatible with the purest chastity. Denman thought they sometimes originated in the uterus as independent formations, and Sir Charles Clark inclined to the opinion that uterine hydatids might exist apart from pregnancy. Cases are recorded, in which uterine hydatids have been retained long beyond the usual period of gestation. Madame Boivin, Baudelocque, Ryan, Desormeaux, and Velpeau, are quoted by Dr. Montgomery, as being in favour of the belief that this form of degenerated ovum may be retained for many months or even years after the ordinary date of labour. I am not aware that any recent case of this kind has been observed. The tendency of all modern research, moreover, has been to demonstrate that the genuine mole cannot occur except as the result of impregnation, and the degeneration of a true ovum. In some instances of twin conception, one fœtus has disappeared under the influence of hydatiginous degeneration, while the other has continued healthy up to the full term. It is related of the celebrated anatomist, Beclard, that he was born under these circumstances.

When an ovum is rendered unfit for continuing the development of the embryo in the early weeks of gestation, by the effusion of blood between the membranes, or into the substance of the chorion, or by any other disease of the membranes, it may not be expelled at the time, but remain *in utero*, and undergo the changes which constitute carneous degeneration; or there may be a partial separation of the ovum from the uterus, followed by an attempt to repair the mischief by the reunion of the separated portions. The fibrin of the effused blood becomes pale and semi-organized, and a perverted nutrition of the membranes goes on. The diseased membranes increase in bulk, but become dense, and quite unfitted for the development of the fœtus, which may remain of the same bulk as when the effusion or separation commenced, or become atrophied. This may continue for three or four months, until at length the degenerated ovum is expelled, consisting of the nest-like membranes and a small embryo of two or three weeks' growth, or in some cases the fœtus may have disappeared, and traces only of the umbilical cord remain. Such are the main points connected with carneous degeneration of the ovum. It has often been pointed out that such cases are of considerable importance in a medico-legal point of view. A husband, for instance, may have believed his wife pregnant, and after his absence from home for several months she may abort on his return, of a fœtus so minute as to give rise to a suspicion of her fidelity, unless such a matter could be explained by the death, retention, and degeneration of the ovum.

The next form of embryonic degeneration to be considered is the hydatiginous variety. The latest and best account of hydatiginous degeneration of the ovum is that by Dr. Barnes, in the 'British and Foreign Medico-Chirurgical Review,' contained in the volume for 1855. In this article, the origin of the disease from the perverted growth of the villi of the shaggy chorion is very clearly traced. When treating of the chorion and placenta, we have described the clavate villi of the chorion, and the layers of cells which they contain. These villi increase by a process of gemmation or budding, very similar to the growth of the roots of a tree. From the sides of one villus, other villi, by a process of cell-growth, sprout out, and from these, in turn, others arise. Under normal plastic influences, a due proportion is preserved between the increase of the nutrient and depurative powers of the chorion and decidua, and the requirements of the enlarging embryo. But it sometimes happens that this growth of the villi is abnormal, and the cells they contain increase in size, and become dropsical, constituting the hydatiginous degeneration of the ovum. The hydatids themselves, in the recent state, are full of transparent fluid, and are either round, pyriform, or oblong in

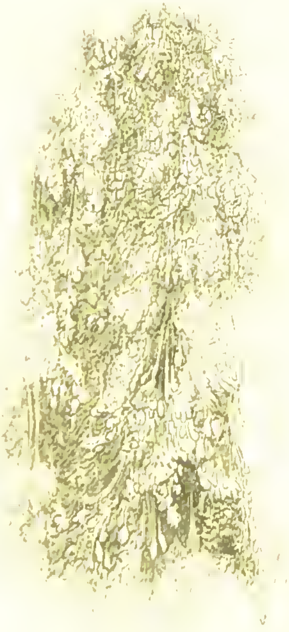
FIG. 58.



Blighted ovum with carneous degeneration of the membranes.

shape, the size of the vesicles varying greatly. Some of them are borne upon pedicles, others are growing from the walls of larger hydatids. Mr. Paget, following Mettenheimer, has pointed out that, on the walls of the primary vesicles, buds appear and develop into separate hydatids, just as the buds protrude from the healthy villi, to produce, by normal growth, new villosities. The pedicles of those hydatids, which appear stalked, are formed of the remains of the base of the villus at the expense of which the hydatid has been formed. As a rule, the activity of the growth and increase of the villi are, Dr. Barnes observes, greatest in early pregnancy, and it is at this time that the hydatiginous degeneration is most prone to occur. Drs. Ramsbotham and Montgomery believe that small portions of placenta, retained *in utero* after parturition at the full term, may become the nucleus of hydatiginous formations; but Dr. Barnes combats this view, from the general history of hydatiginous formations, and the destruction of the fœtal vessels of the placenta, which occur at the time of birth. This question is a very interesting one, and must be considered to some extent as still unsolved. No doubt, the tendencies to the formation of hydatids diminish with advancing pregnancy, but it is not clear that there is any difference between a portion of placenta adherent to the uterus after labour at the full term, and the whole placenta adhering to the uterus after the death of the fœtus, but without exciting the expulsion of the ovum. This form of degeneration frequently commences at a very early date of gestation, and the destruction of the embryo is much more complete than in the fleshy variety of mole. Growth is limited to the chorion and

FIG. 59.

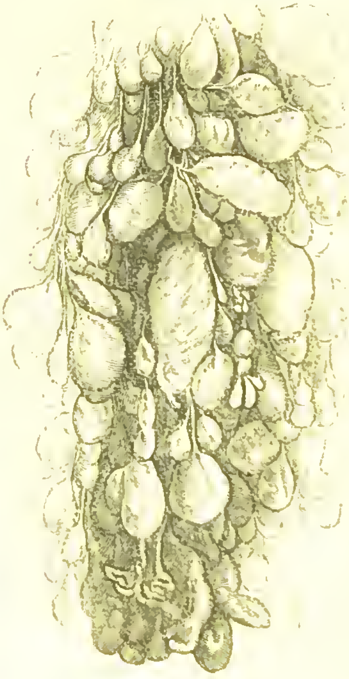


Commencement of hydatid degeneration of the chorion.

the diseased villi, so that all traces of the fœtus generally disappear, the uterus being filled with a mass of hydatids, of various sizes.

Uterine hydatids were compared by Gooch to currants, and by Cruveilhier to a bunch of grapes. Dr. Barnes quotes the objections of Mettenheimer to the comparison of Cruveilhier, and gives the description of Mettenheimer himself. This accurate observer considers the chorion, which is itself a large vesicle or bladder, as the centre of the whole growth. On the walls of this great vesicle, a new generation of cysts is formed, and each of these cysts has the power of producing one or many daughter cysts; or, to use his precise words, "Berry grows out of berry, and the stalks do not unite berries with principal stems, but berries with berries, and, lastly, with a central mother cyst." This arrangement of the vesicles is very well shown in the annexed engraving of a portion of a mass of hydatids, from a preparation by Mr. North, in the museum of St. Mary's Hospital. In the patient furnishing this preparation, enormous quantities of hydatids were expelled at the fifth month, the symptoms being alternate hæmorrhage and watery discharge.

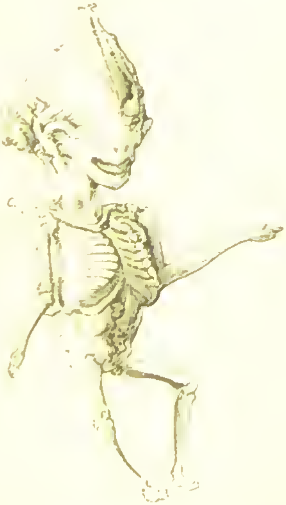
FIG. 60.



Portion of an hydatid mass.

In a third form of degeneration, occurring at a later period of gestation, the placenta may become so diseased as to be unfitted to carry on the nutrition of the fœtus, or the fœtus may die, or be destroyed by disease of the cord, without in either case inducing separation of the placenta from the uterus. The nutrition of the placenta may go on more or less imperfectly, and the fœtus, under these circumstances, becomes shrunken and attenuated to an extraordinary degree. It sometimes occurs that this is the case in twin gestation. Indeed, it seems more prone to happen in twin than in other cases. It may then occur that the shrivelled fœtus may be expelled at some period of pregnancy, the uterus retaining the other to the full term, or the shrivelled and the living embryos may be retained together, and the woman delivered of a full-grown fœtus and one of two or three months at the full term. Such cases are often confounded with cases of super-fœtation. Dr. Simpson has pointed out, that when the dead fœtus is retained with a living twin, it becomes flattened by pressure between the living ovum and the uterus of the mother. Dr. Barnes is of opinion that in fatty degeneration of the placenta to such an extent as to destroy the embryo, two or three weeks from the death of the fœtus is the usual time within which the uterus is excited to expel its contents; but I have seen well-marked cases of fatty degeneration, in which the fœtus died in the early months, but was not expelled until the

FIG. 61.



Shrunken fœtus after retention *in utero*, from a preparation in St. Mary's Hospital Museum.

full term. It is in the highest degree probable that in all cases of death and retention of the ovum, after the formation of the placenta, the retained membranes become the subject of fatty degeneration, and that this also occurs to a considerable extent in what are called fleshy moles.

The symptoms of molar pregnancy vary considerably in the different forms of this disease. In the carneous moles there is an arrest of the breeding symptoms, but the patient remains out of health. The ovum, from the time of its death, becomes to a great extent a foreign body, and is a source of irritation to the system generally. No increase of size takes place, so that, at the fourth or fifth month, the uterus may not be larger than it should be in the fifth or sixth week of normal pregnancy. The complexion is muddy, and the breath fœtid, with loss of appetite and digestion. Hæmorrhage frequently occurs as the degeneration of the membranes proceeds, but not to any great extent, on account of the small size of the uterus. There is sometimes a constant sanious discharge, in which case the health suffers more than usual. But in many of these cases, the symptoms, it must be confessed, are very obscure. This is because the death of the ovum occurs before the symptoms of pregnancy assume a positive form, and while the uterus is comparatively undeveloped, so that there is a considerable resemblance between these early moles, and those mixed cases of amenorrhœa and menorrhagia, frequently met with in practice.

In the hydatid mole, the symptoms are more strongly marked than in the fleshy variety. When the ovum has taken on the hydatiginous form of degeneration, the increase is often enormously rapid, so that at the fifth or sixth month the abdomen is as large as it should be at the end of pregnancy, or even larger. The shape of the uterus is frequently altered from the usual pyriform outline, its growth extending laterally on both sides; or it becomes irregular in form. With the marked increase in size, there is the absence of all fœtal movements, and of the sounds of the fœtal heart, combined with a dense uterine tumour. There is frequently also, after the three or four months of suspension of the catamenia which attends pregnancy, a copious discharge of water and blood, or of water slightly tinged with blood, resembling red-currant juice. This occurs at irregular intervals, and in variable quantities. The watery discharge is accompanied by pains, and appears to be caused by the breaking down of numbers of the larger hydatids. These symptoms are sufficient, in most cases, to make the nature of the affection plain. In a suspected case, the discharges should be carefully examined, and, of course, the detection of a single hydatid, or of a portion of an hydatid, renders the diagnosis certain. Little information is acquired by digital examination in cases of hydatid mole, when the degenerated mass remains altogether within the uterus. But the other cases in which a discharge similar to that commonly met with in hydatids occurs, are cauliflower excrescence, and certain cases of polypus, in which the disease can readily be made out by examination. The loss of health caused by hydatids is often of the gravest character from the quantity of watery and sanguineous discharge. Owing to the extensive attachment of the hydatid mass, its separation is sometimes attended by flooding equal to that met with in placenta prævia. Profound anæmia, failure of the heart's action, dropsical swellings, and even paralysis, have occurred in the course of this disease. Sometimes, masses of hydatids are discharged from time to time; but a portion of the diseased structure being left behind, the growth goes on afresh, and reduces the patient to the greatest extremity of weakness. Two or three washhand-basinfuls of hydatids have been expelled from the uterus at once in some cases.

The moles occurring later in pregnancy, or those in which simple shrinking of the fœtus and degeneration of the placenta occur, have their special symptoms, and may, with care, be recognised by the attendant during their progress. As in the other forms of mole, there is a recession of the ordinary signs of pregnancy. There is also an arrest of increase, and a positive diminution of size in the abdomen. The auscultatory signs of the living fœtus are altogether wanting. Either quickening does not occur, or after having been felt, the movements of the child cease. Peristaltic actions of the uterus may occur, but these can readily be distinguished from the movements of the fœtus. Hæmorrhage is generally present as the degeneration of the placenta, and its partial separation from the uterus, goes on. The loss of blood may be constant, and slight; or it may occur occasionally, and to a considerable extent. This depends on the successive separation of portions of the placenta in consequence of disease, and the irregular contractions of the uterus. In this form of retained ovum, as well as in the fleshy mole, there is frequently a disagreeable discharge, and the health of the patient becomes greatly deteriorated by the irritation of the dead mass, the loss of blood, and the poisoning of the circulation by the absorption of fœtid material.

The treatment of molar pregnancy consists in emptying the uterus of its diseased burden, and in supporting the strength of the patient, and warding off accidents while the mass remains *in utero*. In the carneous moles of small or moderate size, active treatment is very much impeded by the uncertainty of diagnosis. If in a case of suspected molar pregnancy the life of the mother should be threatened, the ovum should be detached by a catheter or the uterine sound, without hesitation. The ergot of rye may be given, with a view to the arrest of bleeding and the excitement of uterine contractions; but in ordinary cases we are obliged to wait, as in abortion, until the ovum presents at the os uteri, or can be reached with the finger, before we attempt to remove it. If the diagnosis of this form of molar pregnancy should become, as we may hope it will, more perfect and certain than it now is, we might separate the ovum by the sound, detach the os and cervix by sponge-tents, or excite the uterus by galvanism. In the case of hydatid degeneration the treatment is more positive. It is usual in such cases to give the ergot of rye to induce uterine contraction. If the os uteri is dilatable, we may introduce the hand, and detach the hydatid mass. Dr. Gunning Bedford relates the case of a woman in extreme danger from loss of blood, in which he broke down the hydatids with a female catheter successfully. The hydatids are sometimes attached very firmly, and I once saw a case in which the uterus had been ruptured by the violence of its contractions in expelling an hydatid mole. In the case of a retained ovum with degeneration of the placenta, the membranes should be ruptured, and the expulsion of the diseased ovum brought on, as soon as the mother's health suffers seriously, or the nature of the case becomes unmistakeable. The after-treatment of such cases is much the same as after ordinary abortion; but it must be said that the health is more injured after molar pregnancy than by the results of simple abortion.

CHAPTER XIV.

SUPER-FŒTATION.—EXTRA-UTERINE GESTATION.—MISSED LABOUR.

The term SUPER-FŒTATION is applied to cases in which one gestation having commenced, a second supervenes upon it during the continuation of the first. We must, before approaching this curious subject, separate certain cases which simulate super-fœtation to a certain extent, but are altogether distinct from it. For instance, we referred in the last lecture to cases in which a woman may be delivered of a blighted ovum, and carry on a second fœtus to the full term; or in which a gravid woman may produce a full-grown fœtus and a shrivelled ovum at the natural time of parturition. Cases are also met with, in which a patient is delivered of two children at the same time, one of which is considerably more developed than the other. Such cases are termed retarded twins, and it is doubtful whether in the case of such twins, conceived at the same time, the retarded ovum may be retained *in utero* beyond the natural term. The instances here severally referred to, are altogether different in principle from cases of super-fœtation, inasmuch as they depend not upon a variation in the time of conception, but upon a difference in the time of development or expulsion, apart from any variation in the time of fecundation.

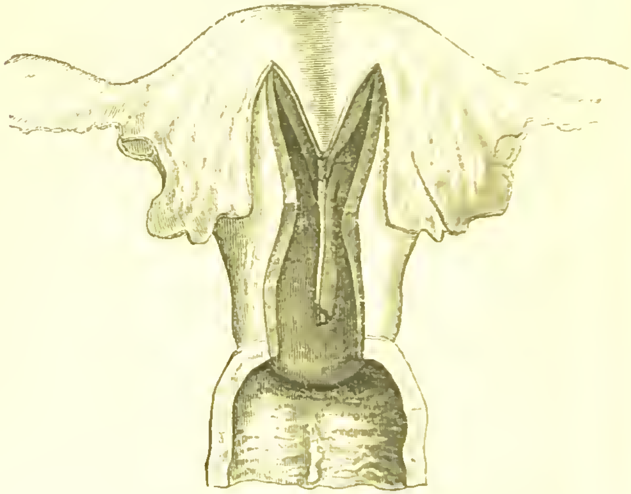
There are several conditions under which super-fœtation may take place; and as the fecundation in twin cases has an interesting relation to this subject, I may mention the chief circumstances under which twin impregnation occurs. It is probable that in many cases of twin pregnancy the second ovum has been fecundated by a coitus occurring subsequently to the first impregnation, and such cases form the most simple instances of super-fœtation. But this is not always the case. In rare instances, in twins, the placenta is found to be single, and I would suggest that these are cases in which one ovule has contained two yolks and two germinal vesicles, just as we sometimes see in birds, one egg with a double yolk, producing two individuals. In these cases the twin impregnation must occur at the same time. More frequently the placentæ and membranes are double, but the placentæ are placed side by side, and in these cases two separate ovules have probably descended from the same ovary, and have been impregnated either at the same or at different times. In some cases the placentæ are attached to opposite sides of the fundus uteri, the inference being that the ova have descended from the two ovaria, but they may have been impregnated by a single coïtus, or otherwise. In all these cases, impregnation occurs within a short space of time, and the same preparation of the uterus serves for the twin fecundation. We have the positive proof that twin ova may be impregnated at different times, in the history of cases in which a white woman is delivered of a white and of a black child, or in which a black woman produces a black and a mulatto, at one birth. In the slave states of America cases of the latter kind are so common as to place the matter beyond doubt. Numerous authorities, including Buffon, Dewees, Dunglison, Beck, and others, testify to the facts, that a white woman married to a white man, and admitting a negro to her embraces after intercourse with her husband, may give birth to a white and a mulatto child at the same time, or that a negress, receiving a white man under similar circumstances, may produce a black and a mulatto infant. Dr. Henry, in his excellent essay on Super-fœtation, quotes a case which occurred in the Brazils, where the indigenous race is copper-coloured, but where there are negroes and whites, in which a Creole woman had three children at a birth, of three different colours—white, brown, and black, with all the features of the respective races. In animals which produce many offspring at a birth, it is not at all infrequent for the young to be the product of intercourse with different males.

Cases are on record, in which women, the subjects of extra-uterine gestation, have conceived anew, and borne children, while the extra-uterine fœtus has remained in the abdomen. M. Cliét, of Lyons, relates a case which had fallen under his own observation, in which a woman died suddenly, and upon dissection, an extra-uterine fœtus of five months was found in the abdomen, while a fœtus of three mouths occupied the uterus. Cases of abdominal gestation, in which the fœtus becomes enclosed in a cyst, and the woman bears other children, are less uncommon than the above. Dr. Montgomery details the particulars of an interesting case, in which two years after an extra-uterine gestation, a woman conceived, and bore three children in succession, while the extra-uterine fœtus remained encysted. Many other writers have recorded similar cases.

In another variety of super-fœtation, the uterus preserves the form met with in the lower animals, being bi-corneal or bi-corporeal, and a conception occurs first in one side of the organ, and after a time in the other. It has been observed that in cases of this kind, when one uterus has received an ovum, the other cavity develops a deciduous membrane, a circumstance which has been urged by Dr. Lee and others against the probability of the occurrence of pregnancy in a double organ at two different times. Numerous apparently unexceptionable cases are, however, on record. The museum of the University of Modena contains the uterus of a woman who died of apoplexy in 1847. This woman had borne many children, and on one occasion she became pregnant, and was delivered on the 15th of February, 1817, of a child, apparently at the full term. The abdomen diminished on one side only, after her labour, and on the 14th of March, she gave birth to a second mature child. This case was regarded at the time, by Professor Bignardi, as one of super-fœtation with double uterus, and his diagnosis was confirmed in a remarkable manner on a post-mortem examination, thirty years afterwards, by Dr. Generali. Of the authenticity of this case there can be no doubt. It may be urged that it was only a case of retained and retarded twin; but the probabilities are against such a supposition, and numerous confirmatory cases have been observed by Cassan, Voigtel, and Boivin, in which a considerably longer time occurred between the birth of the two children. It is worthy of remark, that in cases of double or divided uterus, the two portions of the organ show signs of imperfection. Abortions are very frequent in such cases, and delivery at the full term is often difficult from the imperfect action of the uterus. The term double uterus is not strictly correct, because the organ is single, but divided into two cornua. In the early condition of the human embryo, the uterus is always divided, and the so-called double uterus is merely the more or less perfect persistence of the embryonic type. Occasionally, the vagina is also double or divided.

But in addition to these forms of super-fœtation, other cases are on record, in which the uterus was proved to possess a single cavity. In one related by Professor Eisenmann, of Strasbourg, a woman was delivered of a second child 140 days after the birth of the first, both having been mature. She subsequently bore many other children, and after her death the uterus proved to be single. Unless we discredit this and

FIG. 62.

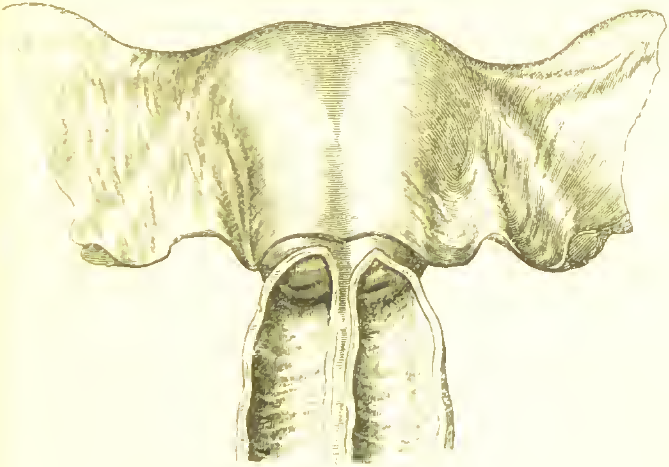


Uterus in which the cavity is divided by a septum, the vagina being single.

similar cases recorded upon good authority, we must conclude that in addition to the fecundation of two ova at short intervals by two male parents (the occurrence of intra-uterine pregnancy after the commencement of extra-uterine gestation) and conception in a second uterus during the course of gestation in a first, pure and simple cases occur, in which, while a single uterus is occupied by one ovum, a second fecundation takes place in the same cavity, generally within the limits of the third, fourth, or fifth months of gestation. A little more than a year ago, I saw, with Mr. Eardley, of Charles-street, Westbourne-terrace, the following case:—A young married woman, pregnant for the first time, miscarried at the end of the fifth month, and some hours afterwards a small clot was discharged, enclosing a perfectly fresh and healthy ovum of about one month. There were no signs of a double uterus in this case. The patient had menstruated regularly during the time she had been pregnant, and was unwell three weeks before she aborted. She has since been delivered at the full term.

Many obstetric writers have combated the occurrence of genuine super-fœtation from the difficulty of explaining the occurrence of a second pregnancy while the development of an ovum is going on *in utero*, so that it may be well to say a few words upon this subject.

FIG. 63.



Bifid condition of the uterus and vagina.

Dr. Fleetwood Churchill is of opinion that the difficulties in the way of receiving the theory of super-fœtation are almost insurmountable. He considers the deciduous membrane to be a shut sac covering the orifices of the os uteri and Fallopian tubes, and that the plug of tenacious mucus secreted by the cervical canal, as well as the mechanical arrangement of the decidua, apparently render it physically impossible that the spermatozoa and the ovule can come in contact. Dr. Ramsbotham considers it impossible to suppose that a second impregnation can occur while the uterus is occupied with another ovum, and that the mucous plug of the cervix, and the decidual lining of the uterus, "would prevent the possibility of a fresh conception taking place." Many other obstetricians agree with these excellent authorities.

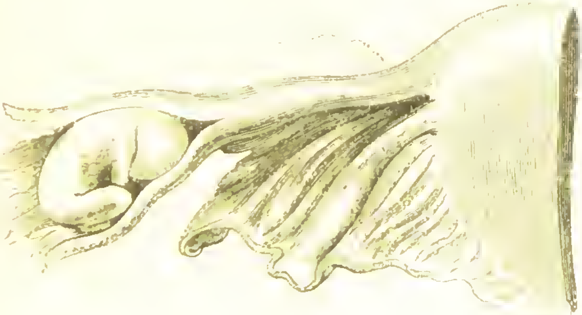
It can, however, be shown that there is no positive physical obstacle to the occurrence of super-fœtation in the mechanical closure of the canal of the cervix uteri, or the uterine apertures of the Fallopian tubes, by mucus and decidua. I have, I think, demonstrated, by numerous microscopical examinations, that the mucous plug of pregnancy is in no respect different, except in quantity, from the mucus found in the cervix in the unimpregnated state, and through which the active spermatozoa must make their way in ordinary fecundation. The mucous plug is, in fact, similar to the secretion formed by the prostate as the medium for containing the spermatic particles. As regards the difficulty presented by the decidua at the os uteri internum and the uterine apertures of the Fallopian tubes, William Hunter taught that the decidua was perforated at these points—namely, the upper part of the cervix and the tubal orifices, and no one has ever shown to the contrary. I have seen numerous preparations which prove that in early pregnancy the decidua stops short at the upper part of the cervix, leaving an opening into the canal of the cervix, and that the two apertures of the Fallopian tubes are distinctly pervious from the uterus. In the first three months the ovum consists of a bag which is only attached to one portion of the parietes of the uterus, leaving the cavity between the decidua vera and reflexa perfectly free. Professor Simpson and Dr. Matthews Duncan have pointed out that in this way the communication between the vagina and the ovary may be free for a certain time after the commencement of gestation. Thus, with the exception of the mucous plug, there is no mechanical impediment between the os uteri and the ovaria, and we have seen that the cervical mucus forms no insuperable obstacle to the ascent of spermatozoa. Super-fœtation, then, cannot be denied from the presumed impossibility of its occurrence. As the bag of the ovum increases in size, so as to occupy the whole of the fundus uteri, the mouths of the tubes are pressed upon by the ovum, but the cervical orifice remains open, with the exception of the mucous plug, until the end of gestation, except in placenta prævia. The infrequency of super-fœtation probably depends more upon the absence of perfect ovulation during pregnancy, than upon any positive mechanical impediment to the ascent of the spermatozoa, or the incapacity of the decidua vera to receive a second ovum.

The ovum may be impregnated, and become attached and developed, at any point between the upper part of the cervix uteri and the Graafian follicle, or it may fall into the abdominal cavity. Whenever the impregnated ovum does not enter the cavity of the body of the uterus, it is called EXTRA-UTERINE GESTATION. The several situations in which this grave error, so to speak, of the generative functions may occur, constitute the different forms of extra-uterine pregnancy. These varieties are, the ovarian, ovario-tubal, tubal, ventral, and interstitial or parietal. In Ovarian gestation, the ovum is impregnated in, and attached to, the Graafian follicle or the external surface of the ovary. In Ovario-tubal gestation, the ovum is attached both to the ovarian and the fimbriated extremity of the Fallopian tubes; but it is probable that in the first instance the ovum adheres to one of these organs only, and becomes attached to the other during its development. In Tubal gestation, the ovum lodges in the Fallopian tube. In Ventral pregnancy, the ovum appears to miss the tube, and becomes attached to the peritoneal surface, generally amongst the convolutions of the small intestines. There is one other form of misplaced ovum, which is usually called a variety of extra-uterine gestation, although, strictly speaking, it is not extra-uterine. This, which has been made out by Breschet, is termed Interstitial or Parietal gestation. The ovum lodges near the point at which the Fallopian tube enters the uterus, and forms a nidus in the walls of the uterus itself. The ovum in these cases becomes surrounded by a layer of the muscular coat of the uterus, similar to the layer which surrounds the majority of fibrous tumours developed in the walls of the uterus. The ovum, in this form of gestation, is developed in a kind of subcavity, formed in the upper part of the uterus, or between the uterine layers at one of the Fallopian angles. We may compare this form of gestation in some respects to placenta prævia, in which the attachment of the ovum takes place at the os uteri internum. One or two rare cases have been observed, in which the ovum must have been developed at the very point of junction between the tube and uterus, where the placenta has occupied the uterus, while the rest of the ovum has been contained in a cyst formed by the dilated Fallopian tube.

The tubal is the most common form of extra-uterine gestation. The ovum becomes enveloped in the chorion, a decidua is formed, and a pouch is developed in the tube, the muscular fibres of the tube being increased to a considerable extent. There is, however, a briefer limit to this than to any of the other forms of extra-uterine gestation. It is seldom prolonged beyond the second or third month, at which time, either from thinning, distension, or erosion, the cystic portion of the tube is rent, and the embryo escapes. In very rare cases the tube continues to enlarge, and the embryo remains in its cyst to the end of the natural term of gestation, or even beyond this. If the ovum remains in the tube long enough, an attempt at the formation of a placenta is made, this organ being very thin and vascular, and it is at the part opposite the attachment of the placental tissue that the rupture of the tube usually takes place. Contemporaneously with the development of the embryo in the tube, a decidual membrane is developed in the uterus in many cases, though this does not occur invariably.

The symptoms of tubal pregnancy are in a great measure the symptoms of all the varieties of extra-uterine gestation. The uterus is felt to be somewhat developed, but not to the extent which obtains in intra-uterine gestation. It is high up in the pelvis, so as often to be beyond the reach of the finger, though it is sometimes lower than natural. Menstruation generally ceases, but there is an occasional sanguineous discharge from the uterus in some cases, and there is sometimes an absence of nausea and vomiting. The ordinary changes occur in the breasts. The tumour of pregnancy is felt higher up than usual, and chiefly on one side of the abdomen. Altogether, the uneasiness experienced in every variety of extra-utero-gestation is greater than in ordinary pregnancies, and often gives the patient the idea of some unnatural condition. When the tube bursts, the patient, generally without any premonition, is seized with agonizing pain, followed by ghastly pallor, fainting, hurried breathing, and fatal collapse. Cases have, however, been met with, in which little pain has attended the rupture of the tube, the symptoms being those of pure collapse. On dissection, the ovum is found in the abdomen, with a rent in the tube, and a large quantity of blood in the peritoneal cavity. At the time of the bursting of the tube, there are indications of uterine excitement, and an attempt at detaching the decidua, where this structure exists. Death is evidently caused by the loss of blood, and by the shock incident to the effusion into the peritoneum. The treatment is unhappily almost nil. Pressure and cold have been recommended. Restoratives and opiates have been given to allay pain and support the patient, but very rarely with anything beyond the most transient good effects. As, with a rare exception or two, all these cases have proved fatal; if the diagnosis were perfect, it might afford a bare chance of safety, in such a desperate conjuncture, to open the abdomen, and attempt to arrest the flow of blood by deligation of the tube.

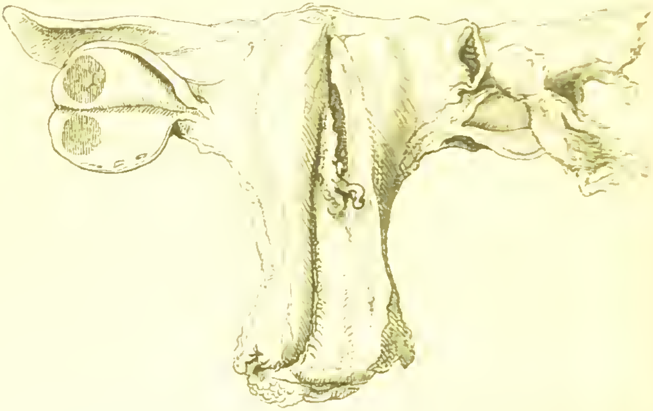
FIG. 64.



Case of tubal gestation.

Some years since, Dr. Oldham wrote to ask my opinion upon a curious circumstance which he had observed in a case of tubal gestation. It was, that the corpus luteum was found in the ovary opposite to the side on which the ovum was lodged. Three explanations suggested themselves. The unimpregnated ovule might have been swept by the cilia of the peritoneum from the right ovary to the fimbriated extremity of the left tube. This would be similar to that which occurs in the amphibia, in which the ova always traverse the abdomen to reach the oviduct. Or the left tube may have reached over to the right ovary, and have taken up the ovule. This was the opinion to which I believe Dr. Oldham and Mr. Wharton Jones inclined. According to the third explanation, it might be that the ovule had descended the right tube, entered the uterus, and then ascended through part of the left tube, by an antiperistaltic action, or by the ciliary currents which move from below upwards. My own opinion was in favour of the ovule having entered the uterus by one tube, and ascended by the other. Such cases are very interesting in relation to the causes of extra-uterine fœtation. Dr. Oldham has now collected three cases of this kind, so that they cannot be very uncommon. The following woodcut is taken from a drawing of one of Dr. Oldham's cases.

FIG. 65.



Tubal pregnancy, with the corpus luteum in the ovary of the opposite side. The decidua is represented in process of detachment from the uterine cavity.

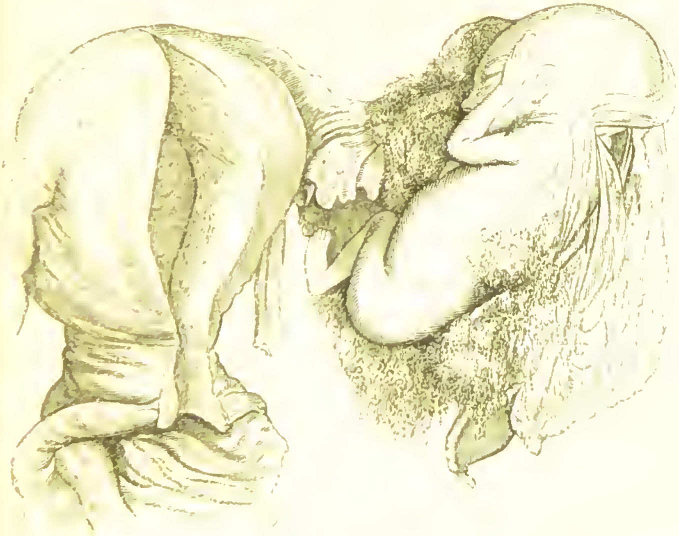
As regards the causes of extra-uterine fœtation, many hypotheses have been advanced. It is believed that there is a greater tendency to this accident in the unmarried than the married, and some curious cases are on record, in which it has happened in women who were the subject of fright or terror at the time of coïtus. In these cases emotion would seem to be a cause. In the ovarian and ovario-tubal varieties, it is suggested that inflammation of the mucous lining of the follicles, or of the indusium, or the extremities of the tubes, may have caused adhesions of the ovum, and it has been said that these forms are prone to occur in courtesans, in whom ovario-tubal inflammation and adhesion are common. In tubal gestation, there may have been large size of the ovum, feeble peristaltic action of the tube, or inflammation of the tubal mucous membrane. In ventral pregnancy, the cause would seem to be the faulty action of the tube in grasping the ovary. In the interstitial cases the ovum has been supposed to lodge in some fold or depression upon the surface of the uterus.

In ovarian pregnancy, the early symptoms are the same as in the tubal variety, but the catastrophe does not occur so early, nor does death take place with the same rapidity. The ovum is in some cases attached to the interior of the Graafian vesicle, the placenta combining with the corpus luteum, or it is seated upon the external surface of the ovary. In the former cases impregnation occurs within the mucous follicle, and the ovule probably never leaves its primary nidus. There is, as in the tubal variety, a thin placenta, and the decidua, chorion, and amnion are formed within the sac. Sometimes death happens as suddenly as in tubal gestation, from the shock and loss of blood attending the rupture of the ovary; in others, the ovarium increases in size, and the fœtus goes on to the full term, when it dies, and may be retained for a considerable period. When this happens, the case follows the course to be presently described, when treating of the termination of ventral pregnancy. In this form of extra-uterine pregnancy, a more or less perfect decidua is formed in the uterus, and there are constant and violent attacks of uterine pain, accompanied by sanguineous discharges. Of the occasional occurrence of ovarian pregnancy there can be no doubt, though it has been questioned, chiefly upon theoretical grounds, by Velpeau and others. I believe, however, that cases have been ranked in this variety in which no pregnancy of any kind existed. Even in the celebrated essay of Dr. Campbell, cases are admitted which are open to doubt. In the case of Louise Adelaide, for instance, on a post-mortem examination, a pouched tumour, occupying the situation of the left ovary, was found, containing hair, teeth, bones, and greasy matter. This may, however, have been a case of ovarian disease without impregnation, in which such structures are occasionally found. The changes in the ovary consequent upon the discharge of an ovule and the formation of a spurious corpus luteum have also, before the function of ovulation was understood, been mistaken for commencing ovarian gestation. In the undoubted cases, the entire fœtus has been found within the sac, or escaped from a perforation in the ovarian cyst. The rupture of the ovarian cyst in extra-uterine cases is generally preceded by uneasiness and pain in the tumour, and seems to be effected by an inflammatory process. In the interstitial form of gestation, the development of the fœtus usually goes on to the full term.

In ovario-tubal and ventral pregnancy, the ovum acquires its nourishment more easily than in the other cases, and the structures surrounding it yield, so that the tendency is to go on to the full term of pregnancy. The auscultatory sounds are the same as in natural pregnancy, but the limbs of the fœtus are felt with great distinctness; hardly more so, however, than in some cases of intra-uterine gestation, where the parietes of the uterus are of unusual thinness. If the cyst containing the ovum bursts, the symptoms are similar to those which occur in ovarian or tubal cases, but less severe. The accident generally happens at a later period, and the pressure of the surrounding organs appears to restrain the hæmorrhage. When rupture does not occur, the fœtus has a tendency to perish at what would be the time of parturition; uterine contractions with the expulsion of the decidua generally occur; there is a lochial discharge, and milk is secreted. The death of the fœtus is sometimes attended by violent movements and convulsions, of which the mother is sensible. These phenomena are probably the result of asphyxia, induced by the unfitness of the placenta to continue its functions. In some cases the child has been considerably larger than at the full term, and it has been supposed that it has lived one or even two months beyond the usual time. After the death of the fœtus, a process of disorganization slowly commences, the bones separate, and the soft parts become converted into adipocirous material. It may become smaller and smaller, the cyst contracting upon it, and remain for a great number of years without causing any considerable inconvenience. More frequently, however, it causes great irritation and inflammation, the residual mass attempting to make its way to the surface, or to the rectum and bladder, to be discharged. This process is attended by suppuration, hectic, colliquative sweating and diarrhœa, great suffering, and deterioration of the general health, which, spreading over a long period, very commonly destroys the life of the patient. Cases, however, occur in which perfect recovery ensues.

The treatment of such cases must be considered in relation to the time preceding and subsequent to the death of the fœtus. Dr. Campbell records nine cases of ventral pregnancy, in which gastrotomy was performed before the death of the fœtus, or shortly afterwards, and all died, probably because of the vascular connexion of the placenta with the abdominal viscera. Nature appears to be more happy in her mode of proceeding, and when the remains of the fœtus point either upon the surface of the abdomen, the vagina, bladder, or rectum, Art may step in and assist the process very efficiently. When the fœtal abscess has burst, the opening may be enlarged to allow of the extraction of the extraneous matter, consisting of a mixture of bones, fatty matter, and the remains of the placenta, which is generally converted into a soft purulent mass. Of thirty cases in which, according to Dr. Campbell, gastrotomy, or the dilatation of a breach already effected by suppuration, was practised, twenty-eight recovered. During this process, which may occupy months or even years, the strength of the patient has to be supported, abscesses dealt with, and inflammatory attacks treated as they arise. In the rare cases in which, in ventral pregnancy, the cyst presents low down in the pelvis, and the parts of the child, such as the head, hands, or feet, can be felt through the vagina, an incision through the vaginal walls into the cyst is a more favourable operation than simple gastrotomy. Dr. Campbell states that of nine cases in which incision of the vagina was performed, in three, both mothers and infants were

FIG. 66.



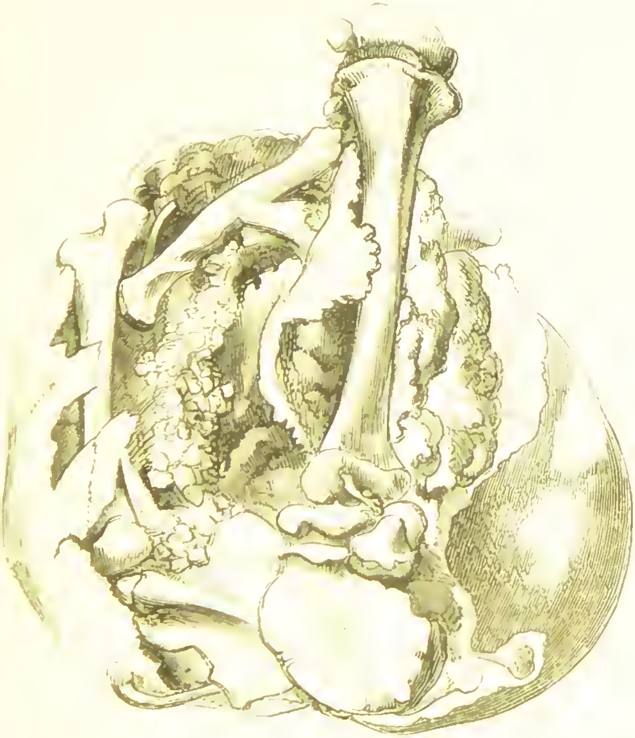
Uterus and fœtus in a case of abdominal pregnancy.

saved; in two the mothers only recovered; in one, the child alone was preserved; while in three, both mothers and children perished.

The present may be a proper place for mentioning a very curious and extraordinary obstetric and physiological phenomenon, far more rare than either super-fœtation or extra-uterine gestation, and having some relationship with both these abnormal conditions. I allude to what has been called MISSED LABOUR, in which the fœtus being *in utero,* parturition from some unascertained cause does not come on at the usual time, but the fœtus dies, and remains included in the uterus, without causing the immediate death of the mother. Dr. Oldham exhibited the uterus and remains of a fœtus, from a most interesting case of this kind, at the first meeting of the Pathological Society in 1846. In this case the child was felt *in utero,* the fact having been ascertained by Dr. Oldham himself, so that no error can be imagined; but parturition did not occur, nor any attempt at parturition. The child died, and became disorganized, portions of the fœtus discharging themselves or being removed through the os uteri for the course of three months from the date of the parturient nisus. At the end of this time the woman died; and on making a post-mortem examination, Dr. Oldham found the remains of the fœtus, consisting of a moulded mass of bones and adipocirous matter. This mass had apparently worn through the anterior wall of the uterus, in the same manner as an aneurism makes its way through the tissues with which it is in contact, and was contained in an imperfect cyst composed of the posterior wall of the uterus and the abdominal parietes. There had been no sign of rupture of the anterior wall of the uterus at any time. The fundus of the bladder was nearly eaten through, so that, if the woman had lived, portions of the fœtus would probably have escaped from the urethra. Dr. Simpson states that similar cases of missed labour are sometimes met with in cows and other animals, and that, as in the above case, the bones of the fœtus become moulded into a compact mass, which may remain a long time *in utero.* The following woodcut represents the residual mass removed from the cyst after death, and which is contained in the museum of Guy's Hospital. (Fig. 67.)

From the similarity of symptoms in this case to those cases of abdominal extra-uterine gestation in which the fœtus is retained, becomes encysted, and is discharged by the bladder or rectum, it seems quite possible that cases of missed labour have been sometimes mistaken for ventral pregnancy. The treatment in cases of missed labour should evidently be to excite the uterus to contraction, if possible, by galvanism or other means, when the time of labour has passed, and the child has been ascertained to be dead, or to combine these means with attempts to break up the fœtus and extract it through the os uteri. When this time has passed by, such cases resemble ventral pregnancy, and require similar treatment. They are, however, perhaps the rarest obstetric complication that can be met with, and have not hitherto been mentioned in systematic treatises on midwifery.

Fig. 67.



Contents of cyst, in Dr. Oldham's case of Missed Labour.

CHAPTER XV.

THE GRAVID UTERUS.

The unimpregnated, virgin, or nulliparous uterus, is from two inches and a half, to two inches and three-quarters in length, its breadth being, from tube to tube, from an inch and a half to an inch and three-quarters. At the end of gestation, the uterus is about thirteen inches long, by eight or nine in breadth; its greatest antero-posterior diameter being eight or nine inches. Levret made some calculations, according to which the superficies of the virgin uterus may be taken at sixteen inches, while, at the time of the coming on of labour, its superficies may be estimated at about three hundred and thirty-nine inches. The cavity of the unimpregnated virgin is equivalent to about three-fourths of a cubic inch; while, when fully developed, it exceeds four hundred cubic inches! The uterus, in the virgin state, weighs about an ounce; and that of a woman who has borne children, about an ounce and a half. Immediately after labour, the uterus weighs about twenty-four ounces; but this weight must be considerably exceeded when it is distended by the fœtus, and when its vessels are full of blood. These facts show the wonderful manner in which the uterus increases under the stimulus of impregnation—an increase having no physiological parallel in any other organ in the human body. This increase is divided between the muscular structure, the mucous membrane or decidua, the lymphatics, the veins and arteries, and the nerves of the organ.

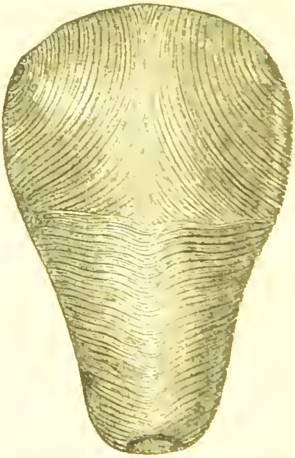
The measurements already given represent the general size of the gravid uterus at the full term; but the capacity of the uterus varies much in individual cases, chiefly from the greater or smaller quantity of the liquor amnii, or the occurrence of twins. In some cases, there is only a very small quantity of liquor amnii; and in others, there may be dropsy, and great distension of the amnion. The shape of the uterus is ovoid, but its figure is somewhat shorter, and the smaller extremity less pointed, than the perfect ovoid. The organ is more developed anteriorly than posteriorly; and it is somewhat flattened behind. It is moderately filled, but not distended, by its contents. William Hunter, whose descriptions of the gravid uterus are almost as graphic as his beautiful plates, compares it to a bladder partially filled with fluid, in consequence of which it yields to the pressure of the surrounding parts, and is, to some extent, moulded by them in shape. The gravid uterus, when filled with its contents, feels much thinner to the touch than it actually is. Its parietes are from one-third to two-thirds of an inch in thickness; but it exceeds this considerably at the site of the placenta. Occasionally, in twins, the two lateral valves of the uterus are developed in such a way as to leave a division or cleft between them; and cases are met with in which, with one fœtus, the right or left side of the organ is chiefly developed. It sometimes occurs that a particular part of the uterus does not perfectly take on the growth of normal pregnancy, so that a ridge or contracted portion remains in the interior of the organ. The ligaments of the uterus are considerably altered by the gravid state. As the organ increases in size, it expands between the folds of the broad ligaments, so that in their unfolded state these ligaments form the peritoneal covering of the sides of the uterus. As a consequence, the broad ligaments and the ovaria, though they ascend during pregnancy, are lower down in their attachment to the uterus than in the ungravid state. The Fallopian tubes and the ovaria are close to the sides of the uterus, the fimbriated extremities pointing downwards, and the broad ligaments are shortened to the greatest possible extent. The ovarian ligaments lie upon the sides of the uterus, and the round ligaments extend almost perpendicularly downwards from the fundus uteri to the inguinal rings.

The development of the decidual mucous membrane has already been described. The lymphatics of the uterus and its appendages, which were first described by Cruikshank, increase from the minute and almost invisible size, found in the virgin uterus, to the size of a goose-quill, or even larger, in the principal trunks. The lymphatic vessels pervade every part of the gravid uterus, but are especially abundant underneath the peritoneal covering. They follow the course of the hypogastric and spermatic bloodvessels, and reach the entral lymphatic trunks by entering the glands of the sides of the vagina, and the iliac, sacral, and lumbar plexuses of glands. The lymphatics are, no doubt, largely concerned in he processes of the nutrition of the uterine tissues during heir enormous growth, and in that removal of effete material after labour, which, in the course of five or six weeks, reduces the uterus from a pound and a half in weight, to something less than two ounces. The uterine arteries, both the hypogastrics and spermatics, greatly increase in size, particularly the hypogastrics. This increase is greater at the part of the uterus to which the placenta is attached. The uterine arteries, in ramifying in the structure of the organ, have a tendency to anastomose to such an extent as to form an arterial network; and as they plunge deeper into the substance of the uterus, they take a convoluted or spiral course. This spiral arrangement especially occurs before the vessels enter the placenta, the spirals running parallel with the decidua serotina, and immediately beneath it, for the space of half an inch or more, before perforating the decidua to pass into the placental mass. The veins, which, in reverse, accompany the hypogastric and spermatic arteries, are still more enlarged, and form plexuses, especially in the neighbourhood of the placenta, and towards the internal surface of the uterus, of a larger extent than are found in any other veins of the body. The uterine veins do not possess valves, and some of the largest vessels are of sufficient size to admit the point of the finger. Altogether, the mass of blood contained by the arteries and veins of the uterus, in the healthy gravid organ, at full term, must be very great, and forms a considerable portion of its entire bulk. The serous or peritoneal covering of the uterus increases in thickness and extent, and but for the increased strength of the serous coat, it is probable that lacerations of the peritoneum would often occur during the contractions of the uterus in labour.

Formerly, everything was vague respecting the existence and arrangement of the muscular fibres of the uterus. The possession, even, of muscular fibres by the human uterus was argued because they could be seen in the lower animals, and because, from the functions of the uterus, they were necessarily believed to exist in this organ, rather than because they could be satisfactorily made out in dissections. In the magnificent plates of William Hunter, the external surface of the uterus presents no definite muscular arrangement. This great anatomist could find nothing but "irregularity and confusion," except upon the inner surface of the organ, where he observed the fasciculi to have in some degree the regular arrangement observed in other muscular structures. His description of the internal layer of muscular fibres is perfect even at the present day. He gives an account of the circular fasciculi surrounding the body of the uterus, and the two concentric circular planes of fibres which surround the orifices of the Fallopian tubes, and gradually blend with the circular fibres of the body of the organ. William Hunter saw the analogy between these concentric rings—the orbiculares muscles, as he terms them, of the fundus uteri and Fallopian tubes, and the circular muscles found in the two horns of the uterus in animals possessing the uterus bicornua. His words are, "The better to conceive this arrangement of the internal muscular fibres, we may suppose each corner of the fundus uteri, where the tube is inserted, to be stretched or drawn out, so as to make two horns, or a bifid uterus, as in the quadruped; then, if we understand the inner fibres to be circular in every part of the uterus, we clearly understand how they will be circular in the human uterus upon its body, and likewise circular and concentric at each corner of the fundus." Before this time, Ruysch had described the fundus uterus as possessing a single circular muscle only. Sir Charles Bell carried our knowledge of this subject a step further, and described the muscular fibres diverging from the round ligaments to spread over the whole of the organ, and he considered these ligaments as in some respects the tendons of the external fibres of the uterus. His conclusion was, that the circular fibres prevailed towards the fundus, and that the longitudinal fibres were most apparent towards the os and cervix.

According to the recent descriptions of Kölliker and other minute anatomists, who have combined the use of the scalpel with the microscope in their investigations, the gravid uterus possesses three layers of muscular fibres, all of them being of a paler colour than is found generally in other muscles. These three layers can be made out with tolerable distinctness, but not so clearly as we can make out the circular and longitudinal layers of the Fallopian tube or intestine. The internal stratum, or the inner layer of William Hunter, is thin, and composed of delicate circular and transverse fibres, the circular fibres being found chiefly in the middle of the body of the uterus, around the Fallopian tubes, and at the os uteri, in which latter position they form an imperfect sphincter. The middle layer is thick and strong, consisting of flat bundles of fibres, running in different directions, interlacing with each other, and surrounding the vessels of the uterus. These bundles of fibres are more loosely arranged than those of the internal layer, giving the middle portion of the uterine parieties a spongy appearance. This stratum is strongest at the fundus uteri, where it seems to consist of several layers. The external layer consists of transverse and longitudinal fibres, forming a thin stratum, immediately beneath, and intimately connected with, the peritoneal covering of the uterus. The longitudinal fibres are arranged chiefly upon the anterior and posterior surfaces of the organ, and extend from the fundus to the lower part of the cervix. The transverse fibres of this layer surround, or nearly so, the organ, and fibres derived from it are continued, not only into the round ligaments, but into the broad and ovarian ligaments, so as, in effect, to connect the fibrous structure of the uterus with the fibrous stroma of the ovaria. The following woodcuts show, in a diagrammatic form, the different layers of the uterine muscular fibres. (Figs. 68, 69, 70.)

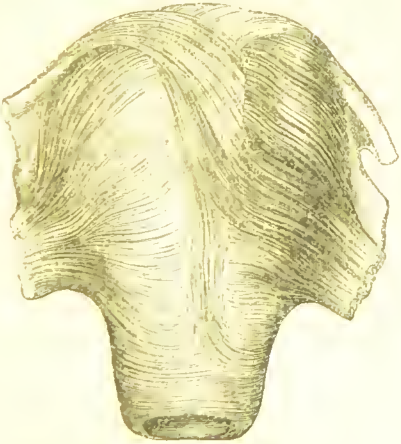
FIG. 68.



Internal layer of uterine muscular fibres.

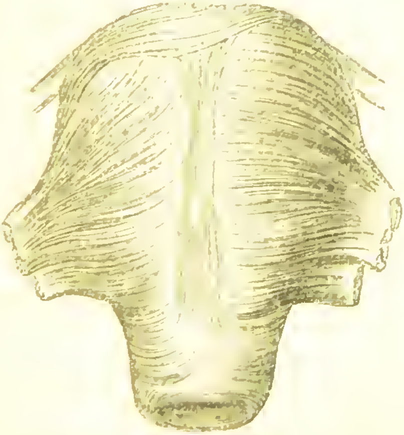
Sir Charles Bell pointed out a fact which has been confirmed by subsequent observers—namely, that in all parts of the uterus muscular fibres are found to surround the bloodvessels, and that this is especially the case with the open vessels upon the surface from which the placenta has been detached. William Hunter had observed that at the site of the placental ttachment the inner layer of muscular fibres lost its regu-rity, and was found to be interlacing amongst the blood-ssels. The bearing of this arrangement upon the arrest of emorrhage after the placenta has been detached is obvious.

FIG. 69.



Middle layer of uterine muscular fibres.

FIG. 70.



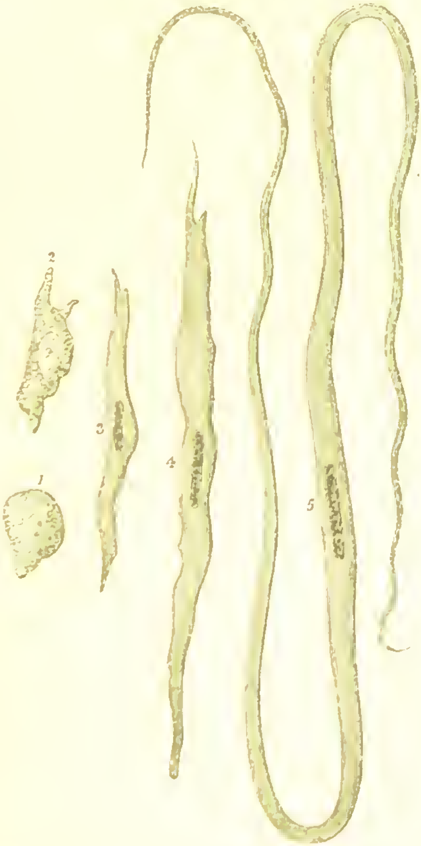
External layer of uterine muscular fibres.

Sir Charles Bell found that when the muscular fibres were contracted, the mouths of the vessels were closed, and *vice versâ.*

As regards the intimate structure of these muscular layers, upon which the great increase in the mass of the uterus or its devolution chiefly depends, much has been made out by recent inquirers, especially by Virchow, Franz Kilian, Heschl, and by Mr. Rainey in this country. The mechanism of the Involution and Devolution of the uterus during pregnancy and after parturition is now tolerably well understood. When describing the unimpregnated uterus, we have seen that the chief bulk of the organ is made up of fusiform embryonic cells, possessing central nuclei. The embryo fibre cells are described by Kölliker as about $\frac{1}{4000}$ of an inch in diameter, their length being somewhat greater than their diameter. As soon as fecundation and the deposition of the ovum has occurred, these fibre cells begin to elongate by growth at each extremity, the nucleus remaining in the middle portion of the filament. The nucleus itself elongates, but the great increase in length is in the portion of the cell surrounding the nucleus. At the time of parturition, the fibre cells have so increased, that they measure in length from seven to eleven times greater than in the embryonic state. Their width is also increased from two to five times. There is not only an increase in the fibre cells already existing in the uterus at the time of conception, but new generations of fibre cells are produced during the course of gestation. This new development of cells takes place chiefly in the internal and middle muscular layers, though it also occurs in the outer layer. The new formation is especially active during the first half of pregnancy. After the sixth month it is believed to cease, and from this time the embryonic cells are all developed, so that at the time of parturition, nothing but the colossal fibre cells are met with. It is these fibre cells which collectively give the uterus its enormous contractile power at the time of parturition. The ligaments of the uterus increase in size chiefly from the development of the muscular fibres which they contain. This is particularly the case with the round ligaments, and Kölliker supposes that the enlargement may depend upon the growth of the fibres derived from the uterus, and also upon the increase of the bundles from the internal oblique, which contribute to form the ligamenta rotunda. (Fig 71.)

After the occurrence of labour, these gigantic fibre cells are no longer needed, and the uterus has to return in a comparatively short space of time from a weight of twenty-four ounces

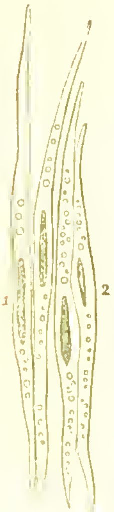
FIG. 71.



1 & 2. Embryonic nucleated fibre cells of the unimpregnated uterus. 3, 4, 5. Muscular fibre cells of the gravid uterus in different stages of development.

one ounce and a half. The necessary involution of the terus is effected chiefly by the atrophy and fatty degeneration f the colossal muscular fibres, and the absorption and removal f the fatty matter by the kidneys, the mammary glands, and from the internal surface of the uterus itself. The whole uterus becomes soft; it is difficult to insulate individual fibre cells from their excessive friability, and they are found to be studded with oily particles in their interior. The disintegrated muscular fibre of the uterus, taken into the system by absorption, probably contributes to the formation of the caseous matter of the milk first secreted, and fatty elements are found in the urine at this time, and abundantly in the lochial discharge. A brief, but very excellent account of the post-partum changes occurring in the uterus has been given by Dr. West, in the thirty-fourth volume of the "Medico-Chirurgical Transactions." During the involution of the uterus after labour, chiefly, as we have seen, by the fatty degeneration of the muscular fibres, a new series of nucleated fibre cells, having the shape and size of the fibre cells of the virgin, or nulliparous uterus, is formed. Kolliker states that three weeks after parturition, the embryonic fibre cells again appear, though a longer time than this expires before the complete fatty disintegration and absorption, or discharge of the developed fibres is accomplished. Probably two or three months have elapsed before the involution of the uterus after delivery is completed. Frequently the involution, as pointed out by Dr. Simpson, is not complete, when menorrhagia is the result. In other cases the involution is excessive, the uterus becomes smaller than before the occurrence of impregnation, a state which leads to amenorrhœa, and subsequent infertility. Thus, as observed by Franz Kilian and Mr. Rainey, the highly developed muscular structure is removed, and a more lowly organized structure formed in its place, after each labour, so that the gravid uterus of each successive pregnancy is, to a great extent, a new organ. (Fig. 72.)

FIG. 72.



Muscular fibre cells a fortnight after delivery, in a state of fatty degeneration.

The uterus receives its supply of Nerves from the hypogastric, sacral, and spermatic nerves. Below the bifurcation of the aorta, we have the aortic plexus dividing into the two hypogastric nerves. The hypogastric nerve on each side forms, in its descent to the cervix uteri, the hypogastric plexus. The hypogastric plexus, when it reaches the cervix, terminates, according to the dissections of Dr. Lee, in the hypogastric ganglion. Into the outer and lower portion of the hypogastric ganglion, branches enter from the third, and sometimes from the second and fourth, sacral nerves. From this ganglion nervous fibres are distributed to the muscular structure and the internal surface of the os, cervix, and body of the uterus. Dr. Lee describes sub-peritoneal ganglia and plexuses upon the external surface of the uterus, which maintain connexion with the hypogastric ganglion below, and the spermatic ganglion and plexus above. The nerves of the virgin uterus are arranged in a serpentine form, and are always accompanied by branches of an artery and vein.

We now approach the much-vexed question of whether the nerves of the uterus increase during pregnancy or not, than which nothing has more agitated or perplexed the anatomical and obstetric world in modern times. William Hunter, arguing from analogy, suspected that the uterine nerves enlarged in the same proportion as the blood-vessels. John Hunter thought the gravid uterus independent of nervous agency, and capable of motion "within itself," and he denied that the nerves were in the slightest degree increased during pregnancy. Tiedemann was the first to publish figures of the nerves of the gravid uterus, copied from actual dissections; but his two plates, taken from a woman who died six days after delivery, represent a very sparing supply of nerves. Since this time, it has been generally assumed that the nerves of the uterus are thicker at the time of parturition than in the unimpregnated state, though some anatomists, as Lobstein, Osiander, and Longet, have either denied the existence of uterine nerves, or have limited this organ to a very scanty supply, both in the unimpregnated and gravid states. Dr. Lee, many years ago, threw himself into the investigation of this subject, and he has pursued it ever since with characteristic ardour. He has made numerous dissections, which, in his own opinion, and in that of a host of authorities who have examined his preparations, prove to demonstration that the nerves of the uterus increase to a very great extent during pregnancy. All analogy and reasoning confirm the general truth and fidelity of Dr. Lee's dissections; and the most recent investigations, by those aloof from all personal feeling, are chiefly in his favour. Remak states, as the result of his dissections, that the nerves enlarge during gestation. Kilian has made numerous researches in the lower animals, which prove that the nervous fibres, in a medullated condition, can, during pregnancy, be traced further into the substance of the uterus than at other times; while, in the unimpregnated uterus, the nervous fibres are found, even upon the surface of the uterus, in an embryonic, non-medullated state. Kölliker can see no impossibility in the multiplication of ganglion cells and fibres, and in the addition of newly-formed nerve fibres as branches to other nervous fibres; or that the nerves, by a multiplication of their ultimate divisions, may ramify over larger spaces during pregnancy than at other times. That the pre-existing nervous fibres increase in width and length, and may be traced further into the interior of the uterus in the gravid organ than at other times, Kölliker entertains no doubt. Dr. Lee believes that very shortly after labour the uterine nerves diminish in size, and return to the condition which obtains in the unimpregnated state.

Dr. Snow Beck has executed some dissections of the gravid uterus, which appear to contradict those of Dr. Lee. Dr. Beck believes that the nerves of the uterus are not by any means so large or so numerous as they appear in Dr. Lee's dissections. He considers that the nervous arrangement at the neck of the uterus should be called the pelvic plexus, instead of the hypogastric ganglion; and that the sacral nerves do not enter into that portion of the cervical plexus which supplies the uterus, but that they are distributed to the vagina and other parts. Dr. Beck further believes that there is no increase in the size of the nerves during pregnancy, but simply that the nerves which, in the virgin uterus, have a sinuous arrangement, become straightened during gestation. There are, it must be said, certain anatomists, having great authority, who hold with Dr. Beck that the nervous supply of the uterus is very restricted, having little relation, as regards size, with the importance of the functions it is called upon to perform. It should be said, that Dr. Lee and Dr. Beck have executed their dissections upon a different principle, which may go somewhat towards accounting for the different results at which they have arrived. Dr. Beck has, by very minute dissections, cleared the nerves of the neurilemma; while, in most of his dissections, Dr. Lee has preserved the neurilemma, as a constituent part of the nerves. But for this difference, the results of the two dissections could scarcely have been so antagonistic as they now are. With every anxiety to form a correct opinion, I think it must be said, that during the last few years, the new evidence which has been brought to bear upon this important subject has been very greatly in Dr. Lee's favour. According to the researches of M. Robin, Dr. Heschl, and others, it is the neurilemma which chiefly enlarges during pregnancy. Dr. Lee states that his own opinions are in accordance with this view.

CHAPTER XVI.

THE NERVI-MOTOR FUNCTIONS OF THE UTERUS.

UTERINE muscular and nerve fibre have been considered in the last chapter, and we come now to the study of the motor functions performed by the gravid uterus. The developed organ is as strictly a muscle as the heart or diaphragm, and it is the chief agent by which the expulsion of the fœtus is effected. It is of immense importance that the nature of uterine muscular action should be understood, since we are obliged to take it into account in all cases of natural labour, and still more so in cases of preternatural parturition. One class of accidents during labour, of which rupture of the uterus is the type, arises from excessive uterine action; while another class of scarcely less importance, of which hæmorrhage may be regarded as an instance, depends upon deficient uterine action. The older writers pondered much upon the motor powers of the uterus, though the data upon which they reasoned were slender and imperfect. It is, however, remarkable, considering the interest of the subject, that it has not been satisfactorily discussed in any modern work upon obstetrics. The little actually known upon the subject has been almost entirely confined to works on general physiology. This has arisen, in great part, from the idea that the uterus was so unlike the general muscular system, that it could not be reduced to physiological rule. But the muscular structure of the uterus, and its dependence upon the nervous system, having been made out in recent times, it becomes necessary to study accurately the nervi-motor endowments of the gravid organ, which is certainly the largest, and as regards the perpetuation of the race, the most important muscle of the human economy.

The uterus is in relation with the Cerebral, Spinal, and

Ganglionic divisions of the nervous system, and possesses properties derived from each of these sources of motor power.

In the first place, let us consider the relation of the Cerebral system to uterine motor action, as seen in the influence of Volition and Emotion.

The uterus is withdrawn from the direct influence of Volition. The will has no direct power either to contract or to dilate this organ. Labour may take place when cerebral paralysis exists, the will being entirely in abeyance, but the uterine movements dependent on reflex action and peristaltic action remaining perfect. But though not exerting any direct influence, volition may affect the uterus indirectly. In certain cases of uterine inertia, when the contractions of the uterus have entirely ceased, voluntary efforts are sometimes sufficient to reproduce uterine contractions. Efforts at expiration, with the glottis closed, cause the abdominal muscles to compress the uterus mechanically, and this compression stimulates the uterus in the same way as manual irritation of the organ. What is called in other organs, Consensual action, may also probably be excited in the uterus, to some degree, by volition. Violent voluntary action quickens the action of the heart, and the voluntary contraction of the internal rectus muscle contracts the iris, though both the heart and the iris are removed from the direct action of volition. In a similar manner, the uterus, during parturition, is probably affected by the intense efforts at expiration and bearing-down, which accompany the pains of labour.

A very powerful influence may be exerted upon the uterus by Emotion. A fright, or any violent mental disturbance, may bring on labour prematurely, or produce abortion. During labour, any sudden emotion of the mind may increase or arrest uterine action. The different effects of hope or despair on the commencement, progress, and termination of labour, have frequently been remarked. Emotion often plays the part of Tantalus to the accoucheur. His entrance into the lying-in room may arrest the pains of labour for a time, through the influence of emotion: but if he should leave the house, they as often return with increased vigour, and terminate the labour abruptly in his absence. After delivery, the maternal emotion excited by the sight of the infant causes the uterus to contract in a remarkable manner. Emotional, like voluntary action, is psychical in its nature, and originates in the cerebrum; but it acts upon the uterus and other parts through the spinal marrow, the great organ of physical motion. This is evident from the fact that emotional movements may occur in parts which are entirely paralysed to cerebral voluntary motion.

Let us now refer to the forms of uterine action depending upon the Spinal Marrow, a subject which did not admit of comprehension before the beautiful discovery of the Spinal or Diastaltic System by Dr. Marshall Hall.

The Reflex Spinal or Diastaltic action of the uterus is excited in various modes; and it is upon this form of contraction, aided by peristaltic action, and the extra-uterine reflex actions excited during the process, that natural parturition essentially depends. Contraction of the uterus, of a reflex or diastaltic kind, may be excited by irritation of the mammæ, as in the act of suckling the infant; by the impression of cold upon the vulva or abdominal surface; by irritation of the rectum, as by a stimulating enema; by gastric irritation, as in drinking a gulp of cold water, or swallowing a piece of ice; by ovarian excitement, as in the occurrence of abortion from the menstrual nidus; by irritation of the vagina or pressure on the perinæum; and by irritation of the os and cervix uteri. These facts supply the proof that the uterus is endowed with reflex action, and that the motor nerves of the uterus are in relation with the mammary, pubic, rectal, pneumo-gastric, ovarian, and vaginal nerves, and the nerves of the os and cervix uteri, as incident excitor nerves. There can be no doubt that in an organ thus subject to reflex action, its own nerves are excitors, and that in all contractions of the uterus excited by irritation of the internal surface of the uterus or of the os and cervix during the passage of the fœtus, the uterine actions are both reflex and peristaltic. That the internal surface of the uterus possesses incident spinal nerves, is proved by the occurrence of vomiting, &c., from uterine irritation. There is indeed no instance of a mucous surface wanting the power of exciting reflex action in other parts of the body. It is a question if any pure spinal fibres reach or proceed from the uterus, unmixed with fibres from the ganglionic. This admixture produces a curious effect upon the reflex contractions of the organ. If we irritate the conjunctiva with a feather, the orbicularis muscle contracts instantly. If we tickle the fauces, efforts at vomiting are immediately produced. But in the case of the uterus, contraction does not follow upon the irritation in so sudden a manner. I have sometimes, in cases of alarming hæmorrhage, had my hand in the uterus for a considerable time, and have carefully watched the influence of reflex stimuli upon the uterus. If, while the uterus remains flaccid, cold water is sprinkled upon the face, the uterus does not act at once, but after an interval of half a minute to a minute, or even longer, the organ slowly begins to contract, reaches its acme by degrees, and as slowly relaxes. The same thing happens if, while the hand remains *in utero*, cold or iced water be injected into the cavity of the organ.

As a motor organ, the uterus stands alone in many respects. Unlike the rectum and bladder, it is not directly influenced by volition; and, unlike the heart, it is extremely prone to reflex action. It more nearly resembles the œsophagus, which is uninfluenced by the will, but is endowed with reflex motion and peristaltic action. It differs, however, from the œsophagus in the number of excitor surfaces with which the spinal system places it in relation. There is no other organ—not even the stomach—which can be excited by so many distinct organs, or which acts as such an extensive excitor of motor action in other parts, both in the impregnated and unimpregnated states, as the uterus.

Besides the reflex action of the spinal marrow, and its system of excitor and motor nerves, there is the Direct action of the spinal centre to be considered, though this form of spinal action does not play the important part assigned to it by Serres, Brachet, and Segalas. In what is termed Direct or Centric spinal action, the spinal centre with its motor nerves are concerned, to the exclusion of the incident or excitor nerves. Various instances of Centric spinal action may be given. Thus, ergotine passing into the blood, affects the spinal centre, and its effects reach the uterus by its motor nerves. Other oxytoxic agents, such as strychnia, carbonic acid, savin, aloes, alcohol, the biborate of soda, and probably ipecacuanha, act in a similar manner. The state of the circulation affects the spinal centre in a very distinct manner. It is well known that there is one form of puerperal convulsion depending upon hæmorrhage, where the heart and great vessels have been nearly emptied of blood, and another caused by fulness of circulation. The convulsion probably depends greatly upon the influence of deficiency or excess of blood in the vessels of the nervous centres. Want or excess of blood, or materies morbi in the circulation, act, then, as direct stimuli to the spinal centre, and in this way the state of the circulation affects the uterus during labour. The uterus acts with increased force when the circulation is either plethoric or anæmic; though, in the latter case, exhaustion of its nervous energy quickly ensues.

We now come to the consideration of the Peristaltic or Ganglionic motor actions of the uterus.

When any part of a muscular organ supplied in whole or in part by the ganglionic system of nerves is irritated, the contraction which ensues generally spreads in a vermicular manner to a distance from the point of irritation, and continues for some time after the exciting cause is removed. This is called Peristaltic motion or action. The uterus is eminently endowed with this peristaltic form of contraction. When one point of the uterus is stimulated, through the abdominal parietes, or by the introduction of the hand into the uterus, the contraction excited extends to the whole organ. Harvey described this peristaltic action of the uterus in the doe. William Hunter saw it in the cat and the rabbit. Müller observed it in the uterus of the rat and the oviduct of the turtle; and I have seen it in the uterus of the guinea-pig and other animals. The heart, œsophagus, and intestine may be excited to contraction after death; and I have seen the uterus and vagina of the rabbit contract rhythmically, when irritated, for several hours after the cessation of respiration. Many cases are on record in which women have died undelivered, but the child has been expelled spontaneously after death. In one case, a woman dying during labour was placed in a coffin, and the fœtus was found the next day perfectly expelled. This post-mortem parturition most generally depends either upon peristaltic action, commencing after the occurrence of somatic death, or upon the rigor mortis affecting the uterus. It is well known that the rigor mortis affects the other involuntary muscles, and especially the heart, which is contracted by this influence to such an extent as to empty the ventricles, and even to simulate concentric hypertrophy. Cases are related in which the fœtus has apparently been expelled some days after the death of the mother by the gaseous distension of the abdomen; but these are different from cases occurring shortly after death, and before decomposition has set in. In the living subject, the peristaltic action of the uterus is the basis of the other uterine actions. In natural labour it is combined with reflex uterine action, and with various forms of extra-uterine action; but, under certain circumstances, it appears able to effect the expulsion of the child without other aid. In paraplegia from disease of the lower part of the spinal marrow, or in animals reduced to the same state by experiment, the peristaltic action is the chief power remaining to the uterus. In such case, delivery has been effected in an imperfect manner by the peristaltic action of the uterus, or the application of galvanism to the organ. It is not, however, known how much of the spinal marrow must be destroyed before the reflex or diastaltic actions of the uterus cease.

In the lower animals the *vagina*, rather than the uterus, is the great organ of parturition. I have many times watched this in experiments on animals which bring forth several young at a birth. The function of the cornua of the uterus, which are thin and feeble compared with the human uterus, is to bring the fœtuses successively to the os uteri, where they are grasped by the thick muscular vagina and expelled without further aid from the uterus. This action of the vagina is very distinctly peristaltic, and remains in full force for some time after death.

Experiments have been performed by various physiologists, with a view to determine the nature of uterine action. M. Serres found that on dividing the spinal cord in gravid animals before the time of parturition, death ensued at variable intervals, but abortion did not necessarily occur. He then divided the cord in animals after the commencement of parturition, and the process was arrested. In other experiments, he excited abortion in animals by irritating the spinal marrow in the lumbar region. M. Brachet divided the cord in guinea-pigs between the twelfth and thirteenth dorsal vertebræ, after the commencement of labour, and everything but feeble contractions of the uterus were arrested, the animals dying in a few days undelivered. M. Segalas made a section of the cord high up without influencing the uterus; but the organ was paralysed when the division was practised low down. Cases are detailed by MM. Brachet and Ollivier, as occurring in the human subject, in which, in paralysis depending upon disease high up in the spinal marrow, uterine action was not interfered with, but was diminished or suspended altogether in cases of paraplegia, the result of injury or disease, low down in the cord. Dr. Simpson has, I have understood, performed some experiments upon pigs which go to negative the experiments of MM. Serres, Brachet, and Segalas. In Dr. Simpson's experiments, which have not been published, parturition is said to have occurred notwithstanding the destruction of the lower portion of the spinal marrow. If Dr. Simpson's results are as I have stated, they will not prove the independence of the uterus of reflex action, since from the connexions of the greater and lesser splanchnic nerves and the thoracic, abdominal, and pelvic plexuses and ganglia, it is quite possible that the uterus may receive spinal motor fibres from the upper part of the spinal marrow.

In the case of reflex contraction of the uterus excited by irritation of the trifacial or the pneumo-gastric nerves, the medulla oblongata must be the centre of the reflex arc, and the motor influence may reach the uterus through the spinal fibres of the splanchnic nerves, without the agency of the lower part of the spinal cord. In progressive destruction of the spinal marrow from below upwards, the animal would probably die, from failure of respiration or shock, before the reflex function of the uterus was annihilated. I have in the preceding page alluded to the difference between the respective influence of the uterus and the vagina in the lower animals and in the human female.

The direction taken by the peristaltic action is of considerable importance. Professor Muller, Michaelis, and Wigand, teach that uterine contraction commences at the cervix, and travels towards the fundus, returning thence towards the os uteri. This is thought by Michaelis to prevent prolapsus of the umbilical cord, and the descent of the arms of the fœtus before the head; the cord and the arm, when lying low in the uterus, being swept upwards, beyond the risk of danger, at the commencement of every pain. Wigand considers the direction of the contraction to be proved by the phenomena attending a labour-pain. At first the os uteri grows tense, the head or presenting part recedes from the touch, and the bladder of membranes protrudes; after this, the fundus uteri becomes hard, and the presenting part of the child begins to advance. I believe this view of Wigand, which has been particularly insisted upon by Dr. Rigby, to be a very accurate description of the direction in which the uterus contracts during a labour pain.

If, as is most probable, the peristaltic action of the uterus does take this course, it is not singular, for, according to the observations of Magendie, the contents of the stomach are, during digestion, passed through the pylorus by a peristaltic movement, which begins at the pylorus, proceeds to the cardia, and then sweeps back again from left to right. Müller also describes the contraction of the heart of the frog as commencing in the venous trunks; then descending, in succession, to the auricles and ventricles; and then affecting the bulbus aortæ. The peristaltic action commences at the auricle, travels to the apex, and then returns towards the base of the ventricle. There seem good reasons for the commencement of the peristaltic action at the cervix in the human subject, in the necessity which exists for some provision against prolapsus of the cord, and arm-presentations; and still more, from the great probability that, if contractions commenced at the fundus uteri, inversion of the organ would be a frequent accident.

In addition to the divers forms of uterine Contraction, the Dilatation of the os and cervix uteri remain to be considered. The dilatation of the os uteri is, in part, mechanical or passive, depending on the contraction of the longitudinal fibres of the body of the uterus, which tend to pull the os uteri open, and also on the fluid pressure exerted by the liquor amnii on the advancing head of the fœtus. But, in addition to the mechanical distension, the os uteri is in part opened by an active mechanical dilatation. The presence of a power of dilatation in the os uteri is not more remarkable than its power of contraction after the completion of labour. We have seen that the os uteri contains numerous fibres arranged in a circular form. But the muscular fibres of the uterus, though of considerable length, do not at any point surround the organ, either in the body or at the os or cervix. This circular arrangement of the fibres, without the existence of single fibres sufficiently long to surround the os uteri, accounts for its power of contraction and dilatation. Before the commencement of labour in primipara, the os uteri is quite closed; while in parturition it is dilated to such an extent as to permit the passage of the child's head—a mass whose shortest diameter is three inches and a half, making the line of the circle necessary for its passage nearly eleven inches. This is a dilatation far exceeding that required in the action of any of the recognised sphincters, and we cannot but believe that if completely circular fibres existed at the os uteri, laceration would be inevitable.

Some of the physiological proofs of the possession of dilatile and contractile powers by the os and cervix uteri may be enumerated, and these proofs are not less convincing than the most certain anatomical evidence. In the first place, if the fibres of the cervix contracted with the same force as the fibres in the rest of the uterus, this organ could scarcely be emptied of its contents. Doubtless the contractions of the body and fundus uteri are strong, their bearing upon the cervix powerful, and the amniotic bag admirably adapted for mechanical distension; but it must be remembered that the short fibres of the cervix act at a great mechanical advantage, as compared with the fibres in any other district of the uterus. Let any one who supposes the body and the fundus may forcibly overcome a contracted state of the os and cervix, consider that the united power of all the respiratory muscles is insufficient to force the small muscles which close the glottis. The nature of the hæmorrhage in placenta prævia, as compared with hæmorrhage from the fundus, affords a strong argument in favour of a positive dilatation of the os uteri. In hæmorrhage from the fundus, the loss of blood is arrested during a pain, because the fundus is in a state of contraction; in hæmorrhage from the os and cervix, the flow is increased at each return of the pains, because the cervix is in a state of dilatation. If the dilatation were merely a mechanical distension, the pressure which dilated the os uteri would arrest the hæmorrhage at the same time.

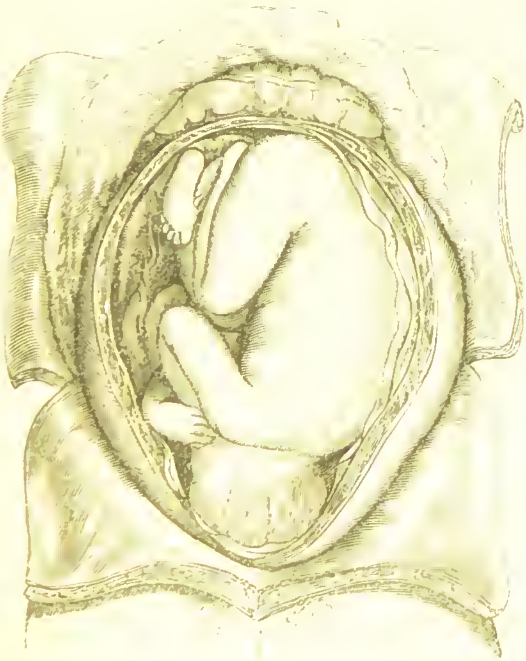
Owing to the mixed mechanical and muscular dilatation of the os uteri, it generally opens slowly; cases, however, occur in which, after long-continued rigidity, it dilates so suddenly, that even from this fact alone it is impossible to consider the dilatation as a mere mechanical distension. But the strongest physiological proof of the existence of muscular power in the os and cervix uteri is the forcible contraction which sometimes occurs after full dilatation—as, for instance, in cases of encysted placenta, in which the fingers can only be introduced with the greatest difficulty; and again, in inversio uteri, where the speedy and powerful contraction of the cervix is one of the elements of the accidents most opposed to the reposition of the organ.

CHAPTER XVII.

THE FŒTUS IN UTERO.

It was an antiquated and fanciful notion, that the fœtus sat upright *in utero*, rubbing its head against the maternal stomach, so as to cause heartburn; and it was supposed that the larger quantity of hair in boys caused a greater amount of heartburn than occurred with female children. Even as late as the time of Sir Fielding Oulde, in the middle of the last century, it was believed that the head of the fœtus was uppermost until the time of the coming on of labour. Although modern researches have shown, that in the latter part of pregnancy, in the great majority of cases, the head of the fœtus is found over the os uteri, obstetricians are not yet agreed as to the precise causes which produce this result. The mature fœtus *in utero*, and the gravid uterus, have commonly, since the time of William Hunter, been described as two ovals, the one accurately adapted to the other. Strictly speaking, the fœtus and uterus are pyriform rather than oval; but the fœtus and uterus are each composed of two oval, rather than circular, figures. In the fœtus, one oval is formed by the head, and the other by the body and limbs of the child. These parts correspond with the two ovals into which the developed cervix and the developed body of the uterus may be divided. The lower oval of the fœtus—that is to say, the head—is little compressible, while the upper and larger oval is greatly so, during the progress of labour; and thus, having in view their different degrees of compressibility, the cranial oval may be considered as the larger or more permanent of the two. Bearing these circumstances in mind, it will, however, be convenient to speak in general terms of the fœtus and uterus as ovoid. The lower end of the fœtal ovoid is formed by the vertex, the upper end by the nates. The outline of one side of the oval is formed by the occiput, the back of the neck, and the incurvated spine; the other, by the forehead and the mass of contracted limbs gathered up together. The chin is close to the sternum, the arms are crossed upon the breast, and the thighs are bent upon the trunk so that the knees approach the elbows in front of the abdomen; the legs are bent upon the thighs and decussate each other, the feet approaching the nates. The position of the extremities, particularly of the upper limbs, varies, however, in different cases. (Fig. 73.)

FIG. 73.



Attitude of the mature fœtus *in utero.*

We possess satisfactory proof that the child assumes the position with the head presenting, in the latter months of gestation, and that dead children do not assume this position with the same frequency as the living. The statistics of Dr. Collins extend to upwards of 16,000 children. In the living children, which exceeded 15,000, only 1 in 57 presented preternaturally, or otherwise than the head; while of upwards of 500 children born in a putrid state, 1 in 5 presented preternaturally. Dubois found that in births occurring before the sixth month, only 52 per cent. were head presentations; of those born during the seventh month, the head presentations increased to 68 per cent.; during the eighth and ninth months, to 76, and, at the full term, to 96 per cent. From an extended table made by Dr. Simpson from the reports of La Chapelle, Boivin, Clarke, and Collins, amounting, in the aggregate, to upwards of 84,000 cases, the proportion of cephalic presentations amounted to 96 per cent. Dubois obtained another important result similar to that deducible from the tables of Dr. Collins, by comparing the comparative frequency of cephalic presentation in dead and living children. Of children born living in the seventh month, the head presentations were in the proportion of 83 per cent.; but in dead children born during the seventh month, the proportions were reversed, no less than 55 per cent. being preternatural presentations.

The chief causes to which the general presentation of the head in living children at the full term has been referred in modern times are, Physical Gravitation, Instinctive and Voluntary movements of the fœtus, and Reflex fœtal movements.

No opinion respecting the cause of cephalic presentation has prevailed so extensively as that which referred it to Physical Gravitation. It was supposed that the weight of the head, as compared with the rest of the body, contributed to its subsidence in the waters of the amnion, and it was further believed that this tendency was increased by the insertion of the umbilical cord in such a manner as to leave the upper part of the body heavier than the lower, when suspended from the umbilicus. Dubois found, however, that in experiments in which the fœtus was suspended in a bath, or in a receptacle having the shape of the uterus, it was not the head, but the scapula or the back which first touched the bottom. This was the result in dead new-born fœtuses of various ages between the fourth and ninth month. Any argument drawn from the supposed suspension of the fœtus by the cord is evidently worthless. The length of the cord is so great as to render any suspension of the fœtus by the cord in the liquor amnii impossible. Moreover, if the cord were short, it is commonly implanted, not into the fundus, but into the side of the uterus. It is also found that twisting of the cord round the limbs or neck of the fœtus exerts no influence upon the presentation, which it should do if suspension by the cord caused the descent of the head. The drift of all fact and argument seemed, then, against the reception of gravitation as the sole cause of cephalic presentation in the fœtus.

Recently, however, Dr. Matthews Duncan has advanced some interesting facts which claim for gravitation a considerable share in determining the intra-uterine fœtal attitudes. Dr. Duncan has pointed out that when the mother is in the upright position, the fœtus lies *in utero*, at an angle of about thirty degrees with the horizon. This plane of support is formed by the glabrous internal surface of the anterior wall of the uterus, and the abdominal parietes. When the woman is lying on her back, the child is still upon an inclined plane, having a nearly similar angle. The plane is now, however, formed by the vertebral column, the abdominal viscera, and the posterior wall of the uterus. It is only when the woman lies upon either side, that the fœtus assumes the horizontal position. The greater part of the twenty-four hours is passed with the fœtus lying upon one of these planes. In the upright position, and when the woman is in constant motion, the influence of gravitation, as far as it extends, must have greater scope than during the horizontal position. The mechanical tendency of the fœtus is to slide down the plane, but this is resisted to some extent by the plane itself, and by the pelvis. This resistance, thus divided, forms the support of the fœtus and of the gravid uterus. The fœtus must be considered not as subsiding simply in water, but as sliding down a plane in an ovoid cavity surrounded by fluid. Under such circumstances, it is contended that the fœtus must have a tendency to obey the laws of gravity, and, with the restrictions mentioned, to slide down the plane. The objection to this is, that in women who preserve the horizontal position during the whole of the latter part of pregnancy, the head presents; but cases of this kind are not sufficiently numerous to found a positive argument upon them.

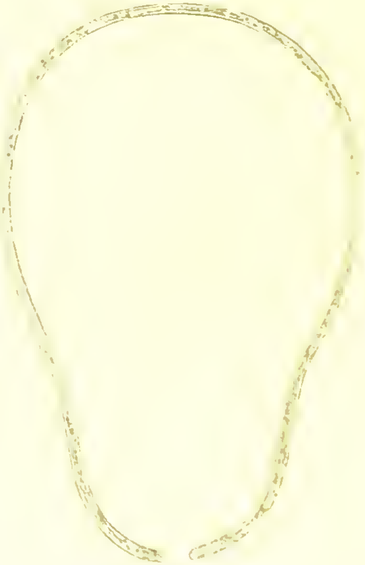
One argument used against fœtal gravitation is, that the head does not present with the same frequency in cases of hydrocephalus as in the case of the healthy fœtus. Dr. Simpson dwells upon the increased weight of the bones of the head and its contents, and shows, by a collection of such cases by Dr. Keith, as many as 1 in 6 present preternaturally, —the proportion, in ordinary cases, it will be remembered, being only 1 in 57. Dr. Duncan points out that it is the *relative* weight of the head in hydrocephalus, as compared with the density of the liquor amnii, which must be considered. Though heavier in air, it is probably more buoyant in water, than the normal fœtal head. To this it may be added that the size of the fœtal hydrocephalic head is frequently such as to render its descent into the pelvis, and its presentation at the os uteri, impossible.

But the strongest evidence against the theory of gravitation was that derived from the greater frequency of preternatural presentations in dead, as compared with living children. It was argued that the dead child ought to obey the laws of gravity as readily and accurately as the living. But it seems to have been forgotten that death may possibly alter the specific gravity of the fœtus. Dr. Duncan found, as the result of fourteen experiments, that when the healthy still-born fœtus is placed in fluid of its own specific gravity, it floats obliquely, with its head lowest, in a position corresponding to that which it maintains *in utero.* He further observed, that in cases where the child has died *in utero*, before the time of birth, changes occur which make it float with its head highest, in a fluid of its own specific gravity. This circumstance, he suggests, may have some influence in determining the frequency of malpresentations in the case of dead children; but he admits that a more extended course of experiments will be necessary before full confidence can be claimed for such results. The ingenious observations and experiments of Dr. Duncan, and the way in which he has met and controverted the objections to the recognition of fœtal gravitation as a cause of position *in utero*, must carry considerable weight. It is quite evident that gravitation cannot be omitted from the several influences which determine the natural presentations of the fœtus.

The latest exponent of the theory which refers the natural presentation of the fœtus to Instinctive and Voluntary movements on the part of the fœtus itself, is M. Paul Dubois, who wrote a very able essay upon the subject in 1832. Dubois, excluding the influence of gravitation, compared the power which leads to the assumption of the position of the fœtus with the head opposite the os uteri to the instinct which leads the bird to build its nest. He supposed that the fœtus, moved by an irresistible impulse, effects the descent of the head, so as to render it the presenting part, by a series of small volitions or spontaneous determinations, occurring during the latter part of pregnancy. The chief argument in favour of the possession by the fœtus of sensation, and possibly of volition, urged by this able obstetrician, is drawn from the harmony which he believed to exist between the movements of the fœtus and the objects which they were presumed to effect. Had he written after the reception of Dr. Marshall Hall's great discovery of the spinal or physical movements, as distinct from the cerebral or psychical motor actions of the animal economy, he would probably have referred the motor powers of the fœtus to reflex action, instead of to instinct or volition. Dr. Simpson, coming after Dubois, has taken reflex action as the clue to the fœtal movements, and has shown that we have no evidence whatever that the fœtus possesses any manifestations which may not be attributed to purely physical causes.

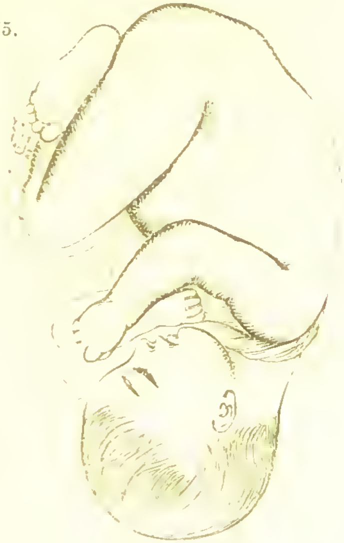
Dr. Simpson, in a series of elaborate and original papers in the "London and Edinburgh Monthly Journal" for 1849, maintains that the fœtus *in utero* is subject to a constant succession of Reflex Motor actions, which are the chief cause of cephalic presentations. Dr. Simpson recognises the ovoid outline of the uterus, and the ovoid shape of the fœtus, as greatly tending to maintain the fœtus in the uterus with the smaller end of the ovoid downwards; but he does not consider that the relations between the form of the fœtus and the form of the uterus would of themselves be sufficient to produce the position, with the head over the os uteri. He believes, on the contrary, that "the regulating vital power guiding it to the assumption of that normal position in which its figure corresponds as exactly as possible to the figure of the uterine cavity, consists of a succession of reflex or excito-motory movements of an adaptive kind on the part of the fœtus, excited by impressions made on its external surface." The physical stimuli causing these movements are referred to temporary irritations of the cutaneous surface of the fœtus by contact with the uterine walls, when the fœtus is thrown out of position by any movements or change of position on the part of the mother, such as rising or lying down, stooping, and other motions of the body. Dr. Simpson points out, that the soles of the feet, the knees and sides, parts which in the adult are marked excitors of reflex action, and which in the young child yield the sensation of tickling, are precisely the parts exposed to irritation in the fœtus. Arguing from these considerations respecting the cause of the normal presentation of the head, Dr. Simpson contends that the causes of mal-presentation are: the occurrence of labour before the reflex actions have established the natural position, the death of the fœtus—in other words, the loss of its adaptive reflex actions; and causes altering the shape of the fœtus or uterus, or physical sources of displacement, such as by hydrocephalus, monstrosities, dropsy of the amnion, uterine spasm, tumours of the uterine walls, placenta prævia, distortions of the pelvis, and accidents occurring to the mother. Finally, Dr. Simpson indicates that in the reflex movements of the fœtus lie the reasons of the rarity of positions of the fœtal head in the direct diameters of the brim of the pelvis, and their great frequency in the oblique diameters, particularly the right oblique diameter, and the greater relative frequency of occipito-anterior to that of occipito-posterior presentations. In these papers, Dr. Simpson refers to the influence of tone as moulding the form and figure of the fœtus, but he takes no account of the uterine movements in the latter part of pregnancy, and repudiates gravitation as a cause of fœtal position. Dr. Simpson illustrates his views by a series of admirable engravings, showing the outline of the uterus and the fœtus under different conditions.

FIG. 74.



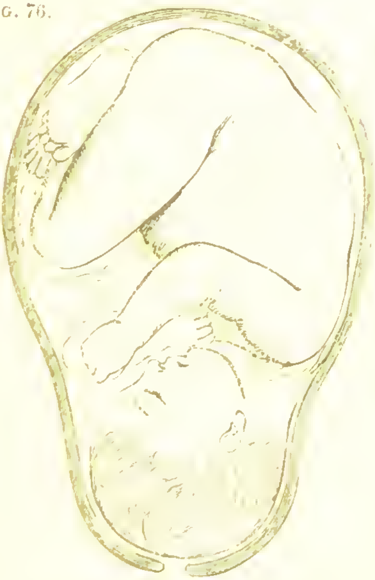
Outline of the ovoid uterus.

FIG. 75.



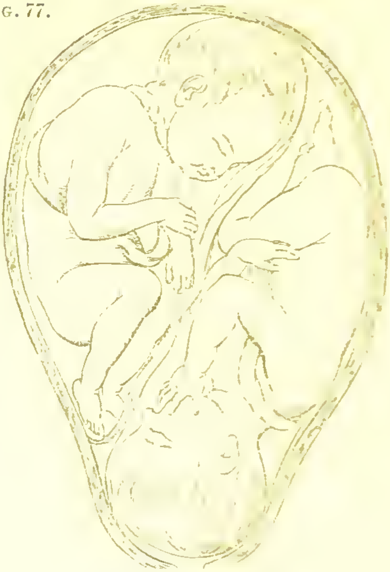
Ovoid form of fœtus at full term.

FIG. 76.



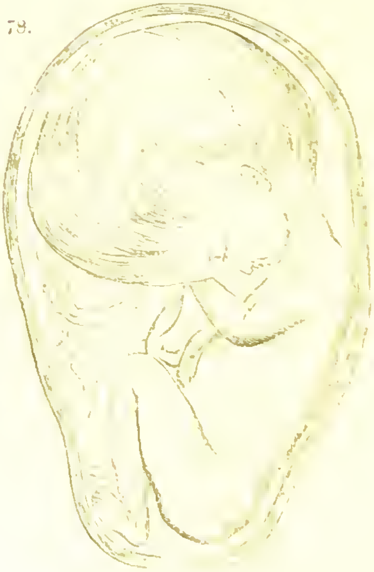
Adaptation of fœtus to uterus.

FIG. 77.



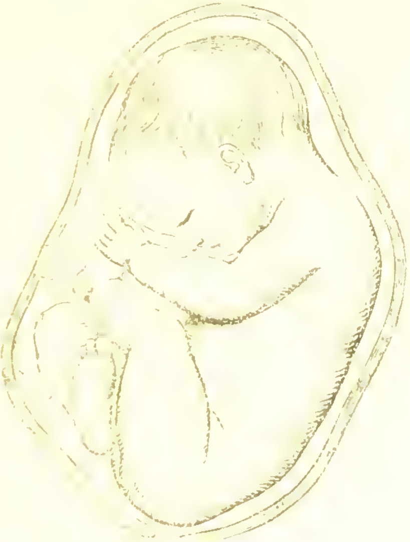
Position of twins in utero.

FIG. 78.



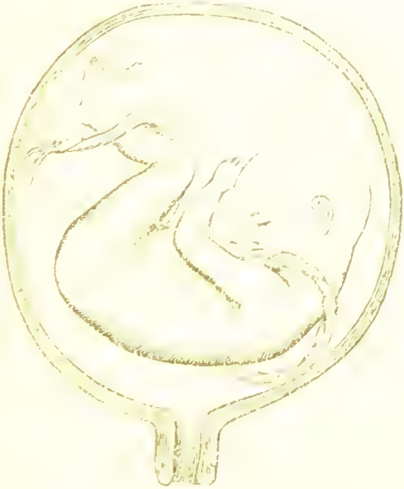
Adaptation of hydrocephalic fœtus.

Fig. 79.



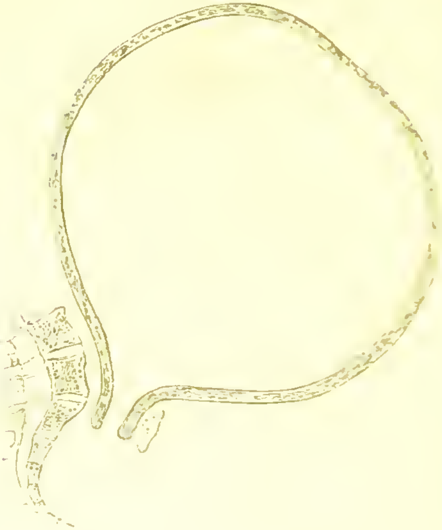
Adaptation of fœtus and uterus in breech presentation.

Fig. 80.



Fœtus and uterus at fifth month.

Fig. 81.



Form of uterus in deformed pelvis.

In my Lectures "On Parturition," published in 1848, before the appearance of Dr. Simpson's papers, while discussing the abdominal movements of pregnancy, I endeavoured to draw a distinction between the movements of the fœtus and those of the uterus. I pointed out that many of the movements commonly attributed to the fœtus really belong to the uterus. I admitted that the fœtus moved in obedience to reflex stimuli, but I supposed these reflex movements to be faint and obscure, because of the provisions which shield the fœtus from reflex excitation. I now believe I underrated the extent and influence of the fœtal movements; but after the best consideration I have been able to give the subject, I think Dr. Simpson has attributed to the reflex movements of the fœtus results, in the production of which other agencies play a very considerable part.

The ovoid shape of the fœtus, towards the end of gestation, depends in part upon the form of the uterus, and in part upon the muscular condition of the fœtus itself. As I pointed out in 1848, the fœtus *in utero* is, when unexcited and at rest, under the spinal influence of what Dr. Marshall Hall calls "Tone," or the continuous influence of the vis nervosa; that principle by which the sphincters are kept closed in after life, and which causes the contractions in limbs which are deprived of the influence of volition in cerebral paralysis. Under this influence, the stronger flexor muscles having more power than the extensors, the body of the child is slightly bent, as it is in the adult in the recumbent position when volition is at rest, as in sleep, and the arms and legs are contracted. This contracted state of the arms and legs, in the fœtus, depends upon an active condition of rigidity; and we see that, after birth, it is often difficult to straighten the limbs—their natural position—until the influence of volition has gradually acquired power, being an approach to that which obtains *in utero*. In the lower animals, the limbs, under the same influence, are straight instead of curved, the fore limbs especially being stretched out rigidly on each side of the head. This is as necessary to healthy parturition in the lower animals, as the contraction of the limbs in the human fœtus. The principle of tone, then, in the human fœtus, tends to preserve the ovoid shape of the fœtus, and it also tends to keep the child comparatively still and motionless. This continued influence of tone tends to maintain the fœtus in a passive state, and under the influence and control of the containing uterus. It is quite as important in maintaining the position of the uterus as the reflex actions are in restoring it, when this has been disturbed by change of position, &c.

In 1850, I performed some experiments with a view to determine the particular reflex movements manifested by the fœtus *in utero* under irritation. I took a rabbit nearly ready to kindle, and having placed it under chloroform, and fastened it to a table, opened the abdomen, so as to expose the uterus. I now made an incision into the uterus opposite the situation of a fœtus, so as not to wound the amnion, or to interfere with the placental attachment. In this way the fœtus was exposed in the transparent amnion without being injured in any way, the circulation in the cord not being at all interfered with. I found that when any part of the fœtus was irritated through the amnion, the fœtus would draw up its limbs, and shortly afterwards returned to the ordinary quiescent state. The one movement which constantly occurred, whether the ears, extremities, or tail were pinched, was a movement of the head, as if in respiration. The mouth was opened and shut again once or twice, in a manner similar to the movements of the mouth and head of a kitten while drowning. No liquor amnii appeared to be swallowed, and no movements of deglutition were attempted. I have repeated the experiment many times with the same result. The respiratory movement affected the whole of the upper part of the body, but no actual inspiration or expiration occurred. It appeared to me that these imperfect respiratory movements must occur with every movement of the fœtus *in utero*, and that movements of respiration do not occur, as is supposed, for the first time, after birth, but that the muscles have been exercised previously. This would account for the curious phenomena of Vagitus, in which, when air reaches the mouth of the fœtus, a cry is produced before the expulsion of the head of the child.

The supposed reflex fœtal movements of pregnancy have been felt in cases of amyelitic fœtuses, when the spinal marrow, and as a consequence, all reflex movements, are absent. I quoted in my work "On Parturition," a case of this kind from Lallemand, in which the spinal marrow was entirely wanting, but in which the supposed fœtal movements were present. Since that time two cases have been supplied to me, one by Mr. Hoadley Gabb, of Hastings, and the other by Professor Zaviziano, of Corfu, in which there was congenital absence of the brain and spinal marrow, but the intra-abdominal movements of pregnancy were profuse in both cases. I have no doubt that a great amount of the movements commonly attributed to the fœtus are in reality peristaltic movements of the uterus. I pointed out that in the state in which the fœtus exists *in utero*, constant excitation and motion would exhaust the fœtus. Professor Simpson compares the fœtus *in utero* to a decapitated frog, but the frog in this condition is speedily destroyed by excitation. I mentioned that in the common experiment of placing the hand in cold water, and then applying it to the uterus, the resulting movements must necessarily be reflex movements of the uterus, excited by the irritation of the excitor nerves of the skin, which we know happens very readily after labour. It is impossible that the influence of this cold hand could be transmitted to the fœtus through the abdominal walls, the uterus, and the liquor amnii. The same explanation applies to the movements caused by taking food or drink into the stomach, for the sensation of hunger. The movements excited by touching the feet, in footling cases, are feeble. The motions produced by lightly irritating the feet of a sleeping infant are inconsiderable, and the soles of the feet are well known to be the most excitable part of the cutaneous surface. We may observe after birth evidence that in some cases the fœtus has been quiet for some time before delivery. The legs of the fœtus may indent each other when they have lain across, or the mark of the hand is left on the side of the head. If the movements of the fœtus were so considerable as have been supposed, we should expect incessant movements during labour. I have no doubt of the frequent movement of the fœtus *in utero*, but wish to insist upon the equal or even still greater frequency of the movements of the gravid uterus itself.

No experiments can imitate, even to a tolerable degree, the conditions of the fœtus *in utero*. Suspending the mature dead fœtus in a similar fluid with the liquor amnii, when placed within a vessel having the shape of the gravid uterus, fails in many of the essential conditions belonging to the living fœtus in utero. In the early development of the embryo, the limbs are deficient in muscular power, and do not assume any definite form. The nervous system has hardly commenced its control over the as yet feeble muscles. The quantity of liquor amnii is very large in proportion to the size of the uterus, and the uterus is circular rather than ovoid in shape. We have to consider these elements as slowly altering from day to day in an almost inappreciable manner, during the middle and later months of pregnancy, and while the fœtus is gradually taking up its ultimate position. The limbs of the fœtus enlarge, becoming subject to the influence of the vis nervosa, and under the influence of tone, the arms and legs, particularly the latter, become contracted, so as to form the fœtal ovoid. During this time, the relative quantity of the liquor amnii diminishes, so that at the full term the liquor amnii scarcely does more than fill up the interstices left between the fœtus and the uterus. Synchronously with these events, the uterus itself, by the development of the cervix, changes from the circular to the pyriform or ovoid shape. With this change of shape, the uterus acquires more power of muscular contraction, and becomes the subject of reflex and peristaltic actions. The contractions of the uterus necessarily exert a moulding or adaptive influence upon the fœtus, poised lightly as it is in the liquor amnii, and moved within the limits of its prison by the slightest impetus. These causes are aided by the reflex movements of the fœtus itself. Under irritation, the limbs of the fœtus strike out, but only to return it more closely to the ovoid shape, and to accommodate it as accurately and easily as possible to the uterine cavity. All these influences, combined with the effects of gravitation and of the inclined planes upon which the fœtus rests in the upright and recumbent positions of the mother, arrange and preserve the fœtus in the normal position with the head at the os uteri. No single power, however, gives its attitude or position to the fœtus, and it is difficult, amidst such a number of adaptations, all contributing to the same end, to single out the most important. If we give the predominence to any one of them, I think the spinal principle of Tone must be considered as the most influential, and it is to the absence of this more than of any quality that we must attribute the irregular presentation of dead children.

CHAPTER XVIII.

DURATION OF PREGNANCY.

The question of the Duration of Pregnancy, involving, as it does, the Cause of the Coming-on of Labour, is one of the most interesting amongst the yet unsettled problems in Obstetrics. It is impossible to rest satisfied with the pious saying of Avicenna, that, "at the appointed time, labour comes on by the command of God," and we are impelled to attempt the penetration of a mystery, which has been the subject of numberless theories and speculations, but which has hitherto baffled all attempts at its satisfactory solution. It may be said that at the present time obstetricians and physiologists are pretty nearly divided between two opinions, as to the time of the duration of gestation, and the circumstances which influence its termination. According to one view, the uterus is excited to expel its contents by the maturity of the fœtus and its membranes. Upon the second hypothesis, the gravid uterus, like the unimpregnated organ, is ruled by the catamenial periodicity, and labour comes on at what would have been a catamenial period, had the woman remained unimpregnated. Both these ideas, in a more or less perfect form, are of very ancient date. Harvey, for instance, taught that parturition came on at the date of the tenth menstrual period after conception. Harvey's master, Fabricius, and still earlier authorities, held that labour came on in consequence of the maturity of the fœtus. In my work "On Parturition," I have adhered to the former view, and attempted to show that the ovaria are the special organs which excite the uterus to the act of parturition. While doing this, I have dwelt upon the maturity of the embryo at the time of labour, and urged it as a manifest instance of the harmony of Nature, that the fœtus should be perfectly developed, and the placenta and membranes showing signs of unfitness for their functions, at the time when the ovaria excite the uterus to expel its contents. I shall, however, proceed to state as impartially as I can the facts which support, or tell against, either theory.

The first thing which merits our attention in this inquiry is the statistical tables constructed by those who have kept registers of large numbers of cases. The late Dr. Merriman made a very careful investigation into the duration of pregnancy, which has been quoted by almost all subsequent writers upon the subject. He reckoned from, but without including, the last day of the last catamenial period, and he gives a table of 150 mature births calculated in this manner. of these,—

5	were delivered	in the	37th	week.
16	,,	,,	38th	,,
21	,,	,,	39th	,,
46	,,	,,	40th	,,
28	,,	,,	41st	,,
18	,,	,,	42nd	,,
11	,,	,,	43rd	,,

This variation is very considerable, and the question suggests itself—In the case of the fifty-seven women who carried the ovum beyond the fortieth week from the last menstruation, was the gestation protracted beyond the usual time, or was it that conception occurred one, two, or three weeks after the last catamenial appearance? To these questions we shall have to revert hereafter. Dr. Murphy has given a table of

182 cases, in which the results were somewhat different from those obtained by Dr. Merriman. In Dr. Murphy's cases, the numbers delivered in the 40th and 42nd week were equal, twenty-five in each week; while in the 41st week, thirty-two labours occurred. The late Dr. James Reid, in an elaborate essay on the Duration of Human Pregnancy, begun in 1850, and completed in "The Lancet" in 1853, gives a table of the duration of pregnancy in 500 cases, calculating from the last day of menstruation. Of these,—

23	were delivered	in the	37th	week.
48	,,	,,	38th	,,
81	,,	,,	39th	,,
131	,,	,,	40th	,,
112	,,	,,	41st	,,
63	,,	,,	42nd	,,
28	,,	,,	43rd	,,
8	,,	,,	44th	,,
6	,,	,,	45th	,,
500				

These results prove, as in Dr. Merriman's table, that, calculating from the last day of the last catamenial period, considerable variations in the duration of pregnancy occur. Is there more regularity in cases where the duration of gestation, or the date of the occurrence of labour, is calculated from the time of a single coïtus? Before entering upon this topic, it must be premised, that in the case of the catamenia frequent mistakes are made by the most careful women respecting the time of its last appearance. Errors, intentional or unintentional, are still more likely to occur in fixing the time of the coïtus which has resulted in impregnation. Many of these cases occur in unmarried women, in whom there is a very constant tendency to declare that the fruitful coitus has been a solitary one. Dr. Reid, in the paper referred to, collects forty-three instances of conception after single coitus, all of them resting upon testimony as credible as can be obtained in such cases. The following table gives the results of Dr. Reid's inquiries upon this branch of the subject :—

260	days after	single coïtus,	delivery occurred in	1
263	,,	,,	,,	1
264	,,	,,	,,	2
265	,,	,,	,,	1
266	,,	,,	,,	2
270	,,	,,	,,	1
271	,,	,,	,,	2
272	,,	,,	,,	3
273	,,	,,	,,	1
274	,,	,,	,,	7
275	,,	,,	,,	2
276	,,	,,	,,	5
278	,,	,,	,,	1
280	,,	,,	,,	3
283	,,	,,	,,	
284	,,	,,	,,	1
286	,,	,,	,,	1
287	,,	,,	,,	
291	,,	,,	,,	1
293	,,	,,	,,	2
296	,,	,,	,,	1
300	,,	,,	,,	1
				43

Thus it will be seen from this table that the average duration of gestation, reckoning from a single coïtus, is about 275 days. But in this mode of calculating the term of gestation, variations quite as great as those which occur in calculating from the catamenial periods, are met with. Dr. Reid, who wrote with a desire to show that the duration of pregnancy should be calculated from the time of impregnation, rather than from the last menstruation, was obliged to conclude as follows:—"If we allow of a range of from two to six days after menstruation as elapsing probably before conception takes place, it will then appear that about the thirty-ninth week after impregnation is more probably the ordinary duration of pregnancy, and this will coincide with the results of the table taken from cases of single coïtus." This means that we can calculate as well from the date of the last catamenia, as from the date of conception, but that in one case we must reckon thirty-nine, in the other forty, weeks. Upon whichever basis we make the calculation, it is proved that the duration of gestation varies considerably, within certain limits, and we must look to other evidence than that derivable from such tables, to show the real cause of the termination of pregnancy, and the occurrence of parturition. In animals, where the date of coïtus can be ascertained with greater accuracy than in the human female, still greater variations in the time between impregnation and parturition in different females of the same species are found to occur. Thus the chief facts educed from these statistical data are, that, in a large proportion of cases, gestation terminates at a certain time, within the limits of a few days, and that this time bears pretty nearly the same relation to the catamenial dates as to the dates of fruitful coition. Dr. Reid's is the largest collection of cases of conception from a single coïtus which has been made, and the result yields the 275th day as the average time for the occurrence of labour. In the calculations from the catamenial dates, Dr. Reid's cases give precisely the same result as those of Dr. Merriman, the average time of the coming on of labour being the fortieth week from the termination of the catamenia. If we get two cases of pregnancy in women in whom the catamenia appeared at the same time, the date of parturition may vary within certain limits. The same variation occurs in the cases of two females to whom impregnation occurred at the same time. If we look to the results obtained from the observations made upon comparative gestation, the same variation of the duration of pregnancy, as calculated from the date of intercourse, is found; and in animals the utmost accuracy as regards dates can be procured. Baron Tessier found that the average duration of pregnancy in 160 cows was nine months and ten days; but of this number 68 went beyond the 280th day, in 20 gestation lasted 300 days, and in 5 instances it was protracted to 305 days. The late Earl Spencer had the duration of gestation accurately noted in 764 cows. Pregnancy lasted on the average 285 days. In 8 cases only was this period exceeded by more than 12 days, and only 1 went 18 days beyond this time. These results differ somewhat from those of Tessier, but there are no grounds for questioning the accuracy of the observations in either case. Other observers have found the same variations in the gestation of the cow. Similar variations have been observed in the gestation of mares, and in elephants; and in the smaller animals, where gestation lasts a shorter time, notable variations in the time of the coming-on of parturition are found to occur. The last hypothesis respecting the variable duration of pregnancy is that advanced by Dr. Clay, of Manchester, who argues from cases which have occurred in his own practice, and the facts known respecting the duration of gestation in animals, that the younger the parent the shorter is the term of gestation. Dr. Clay believes that the ages of both parents influence the duration of pregnancy; but dwells particularly upon the influence of the mother.

In the observations of Lord Spencer, it was found that gestation with males had a tendency to continue a few days longer than gestation with females. There is a popular belief that this occurs in the case of males in the human subject. In our fishing towns, where the dates of the absence of the husband are known, it is said that when gestation is prolonged beyond the usual term, a boy is expected, and that this expectation is frequently fulfilled. Lord Spencer also found that cows in calf by a particular bull had a tendency to go a few days longer than those impregnated by other bulls of the herd.

There is a class of cases not hitherto noticed, by which the duration of pregnancy from the time of coïtus may be ascertained with considerable certainty. In 1851, Mr. Coleman, of Surbiton, drew my attention to the following circumstance:—Two ladies, patients of his, were married on the same day, and both were delivered within ten hours of each other. The marriages took place on the 7th of May, 1850, and one was confined on the afternoon of February 8th, 1851, and the other at two A.M. on the 9th, or 276 days from the date of marriage. Both had menstruated a few days before marriage. I have collected a good many cases of this kind, and they show that in the majority of those in whom labour occurs within the forty-first or forty-second week from marriage, the deliveries occur before, rather than after the 280th day from marriage. It is usual for marriages to take place shortly after a catamenial period, and the inference is, that in these cases impregnation must have occurred within a few days after marriage. Such cases may be used to confirm either the calculation from the last menstrual date, or from the fruitful coïtus. They do not, however, bear distinctly upon the determining cause of labour, and probably no mere statistics will ever settle the question. I now proceed to state the arguments in favour of the maturity of the ovum as the exciting cause of parturition.

Those who consider the maturity of the fœtus to be the cause of labour, point to the periodicity observed in the growth or flowering of plants, the separation of ripe fruit from the stalk, the leaf from the stem, the regularity with which the young of birds are hatched from the shell, the regular appearance and shedding of the teeth, and similar phenomena of growth and development, as favouring the idea that the fœtus separates from the womb, and excites the phenomena of parturition, in consequence of an inherent periodicity occurring as part of the development of the embryo. Dr. Carpenter refers to the placenta as the organ upon which the contraction of the uterus depends. He draws an argument in favour of this opinion from the phenomena of superfœtation, in which one child is detached from the uterus, a second remaining undetached, as he suggests, in consequence of the immaturity of the placenta. Dr. Simpson also has advanced the opinion, that "the loosening or decadence of the membranes and placenta from the interior of the uterus constitutes the determining cause of parturition, and that this loosening, or decadence, is itself the result of the effete degeneration of the structure of the decidua towards the full term of pregnancy."

Those who oppose the view that the catamenial dates rule the duration of pregnancy, ask why parturition should occur at the tenth rather than at the eleventh, or any other menstrual period? But this may be replied to by other questions,—Why, for instance, should the catamenial period, as the rule, consist of twenty-eight days? or why should puberty come on at a particular age? The only answer is, the fact, that these particular periodicities do occur. In animals, the periodicities of œstruation are little known, particularly in the wild state: but it is asserted that the larger animals do not œstruate sufficiently often to render it possible that in their case the duration of gestation can be a multiple of an œstrual period.

There is another point which has already been adverted to in connexion with menstruation, and which is supposed to militate against the ovarian theory of the cause of labour. As the rule, we have seen that the menstrual periodicity recurs every twenty-eight days; but in some women the period returns a day or two earlier or later than this with considerable regularity. Others are regular every fortnight, or every three weeks; or the period returns only every five or six weeks. What multiple of the catamenial periodicity is observed in such cases? I have carefully noted all the cases I have met with of this kind, and I believe that in such women the duration of pregnancy is more irregular than usual. The future collection of such cases will be very valuable in elucidating the true cause of labour, far more so than cases in which the last date of menstruation or the occurrence of a single coitus are recorded. It is said by some who oppose the ovarian theory, that if the ovarian or catamenial periodicity ruled the coming-on of labour, the date of parturition should always be exactly 280 days from the last menstruation. This is hardly a valid objection, inasmuch as in the most regular females, the catamenia often appear a few days before, or a few days after, the expected time; yet no one on this account refuses to accept the ordinary monthly periodicity as the rule amongst women. The irregularities in the duration of gestation are certainly not greater than the irregularities observed in menstruation itself.

The argument in favour of the ovarian influence, as a determining cause of labour, and as regulating the duration of pregnancy, remains to be stated. It is allowed by all observers, that labour has a tendency to occur, and does occur, in a great proportion of cases, in the fortieth week from the last menstruation; and it is equally allowed, that impregnation is generally effected just after the catamenial period. It is also made out by the record of a considerable number of cases in which a single coitus occurred, that gestation lasts, on an average, about 275 days from the actual date of impregnation. These data make the average duration of pregnancy approach 280 days from the last catamenial period, so that the time between the last catamenial period and the occurrence of parturition is, on the average, very nearly a multiple of a single catamenial period. This is a curious coincidence, even if it were proved that the uterine function of parturition was quite independent of the ovarian influence.

But we know that the uterus performs some of its most important functions under the influence and control of the ovaries. It is allowed, even by those who deny the influence of the ovaria upon parturition, that the catamenial function is ruled by the ovaria, that the ovarian phenomena may occur without menstruation, but that menstruation never occurs without the influence of the ovaria. It is admitted by almost, I think I may say, all, practical accoucheurs, that the influence of the ovaria are felt during pregnancy; that women suffer uneasiness at the catamenial dates, and are more liable to abort at these times than at others. This is particularly the case with women who have suffered from dysmenorrhœa previously to pregnancy. In certain cases of extra-uterine gestation, as, for instance, in abdominal pregnancy, the development of the fœtus has frequently gone on to the usual limit of pregnancy, when violent pains, as of labour, and contractions of the enlarged uterus, have come on. Dr. Ramsbotham observes on this point: "It is a curious circumstance in the history of these cases, that if the child should live till the term of gestation is completed, as soon as that time has expired, the uterus takes on itself expulsive action, which is attended with pain similar to the throes of labour; and, during these pains, the deciduous membrane is expelled from the cavity with more or less sanguineous discharge." Cases have been not unfrequently met with in which the ovum has been blighted in the middle part of pregnancy, and in which the decidua and chorion have been diseased; but the mother has carried the diseased ovum for a considerable time, or to the natural limit of gestation, when the molar or degenerated ovum has been expelled. There is another class of cases in which twin gestation is proceeding; but one ovum dies, yet the uterus is not excited to contract, but the dead and living ovum go on to the full term. In cases of superfœtation, when one living child has been born, and birth has been given to the second some time subsequently to that of the first, I have also found that there is a tendency to some multiple of the catamenial period in the interval between the birth of the two children. Dr. Fleetwood Churchill has given an account of the three most remarkable cases of superfœtation on record; and I proceed to an analysis of these cases, quoting the words of Dr. Churchill:—

"In the 'Recueil de la Société d'Emulation,' there is the case of M. A. Bigand, of Strasburgh, aged thirty-seven, who was delivered of a living child on the 30th of April. The lochia and milk were soon suppressed. On the 17th of September of the same year (*i.e.*, about four months and a half after the first delivery) she brought forth a second apparently mature and healthy child." The first labour occurred on the last day of April, so that we have the thirty-one days of May, thirty days of June, thirty-one days each of July and August, and seventeen days in September, in all one hundred and forty days from the first to the second birth, or exactly five catamenial periods, $5 \times 28 = 140$. In a case related by Desgranges, of Lyons, to continue the account of Dr. Churchill, "the woman was delivered on the 20th of January, 1780, of a seven-months child, and on July 6th, 1780, five months and sixteen days after the former birth, she gave birth to a second, which had apparently reached its full time." In this case we have eleven days in January, twenty-nine in February (it being leap year), thirty-one in March, thirty in April, thirty-one in May, thirty in June, and six in July, between the two births, in all one hundred and sixty-eight days, or precisely six catamenial periods, $6 \times 28 = 168$. The third case noted by Dr. Churchill is as follows, from the account of the late Dr. Maton, in the fourth volume of the "Transactions of the College of Physicians":—"Mrs. T——, an Italian lady, but married to an Englishman, was delivered of a male child at Palermo, November 12th, 1807. On the 2nd of February, 1808, not quite three calendar months after the preceding accouchement, she was delivered of a second male infant. Dr. Maton assured Dr. Paris that 'both the children were born perfect;' the first therefore could not have been a six-months child. If we include the day on which the first child was born, the time between the births amounts to eighty-three days, or within one day of three periods of twenty-eight days: $3 \times 28 = 84$. In these cases it is impossible not to recognise the close adherence to the ovarian periodicity, and it is difficult to imagine this a mere coincidence. All such facts militate against the supposition that the irritation of the uterus by the mature fœtus and its membranes induces labour; and support the view that it is excited by extra-uterine and ovarian influence. There is also another class of facts which tell against this hypothesis that labour depends solely upon the maturity of the fœtus and the placenta and membranes, and as a consequence in favour of the ovarian periodicity. Instances are frequently met with in which the placenta becomes prematurely mature and caducous, or affected with degeneration, and the child dies *in utero* shortly before birth. It is well known that in certain women this happens many times in succession, the placenta becoming ripe, and positively unfit for the performance of its functions, without exciting the uterus to expel its contents. It is difficult or impossible to account for such cases on the supposition that the mature ovum excites the uterus to the efforts of labour. It is not that there is any special adhesion of the placenta and membranes to the uterus in these cases; for if the fœtus lives in a feeble condition up to the time of labour, the placenta often separates from the uterus with the first pains, and thus kills the child. On the other hand, labour comes on just as regularly in cases in which the placenta has adhered so firmly to the uterus, in consequence of inflammation, as to require mechanical detachment after labour.

In 1850, I performed some experiments, with a view to determine the possibility of exciting the uterus to contraction by irritating the ovaria. In these experiments I had the valuable aid of the late Mr. Henry Smith, the gentleman who assisted Dr. Marshall Hall in his great course of experimental inquiry. We found that in gravid rabbits chloroformed, and with the abdomen laid open; irritation of the ovaria by galvanism, a heated needle, or pinching with the forceps, excited distinct contractions of the uterus and vagina. In the rabbit at the middle period of gestation, after a few contractions of the parturient canal had been excited artificially by irritation of the ovaria, the intermittent contractions of ordinary parturition went on until the fœtuses were expelled, artificial parturition being thus excited by ovarian irritation. Berthold experimented upon animals during gestation by extirpating the ovaria, and found that this operation invariably led to abortion. I have heard that Dr. Simpson a few years ago performed some experiments with a different result from those of Berthold, but I believe these experiments have not been published. In my work already referred to, I have shown that in many of the lower animals, ovulation and œstruation are going on at the time of parturition, and that many of them admit the male, and conceive again on the same day that the uterus has been emptied.

I have thus advanced, and I believe impartially, the arguments and facts for and against the theory of the ovarian cause of labour, which I believe I was the first to propound. I have for many years taught that the ovaria, acting at or near the tenth period from the time of the ovulation which has ended in impregnation, excite in the uterus those changes which lead to the expulsion of the ovum. I have also compared the show which accompanies parturition, and the lochial discharge which follows it, to the menstrual discharge. It has appeared to me, that the changes in the uterine portion of the membranes are similar to the changes which occur in menstruation, and that the contractions of the uterus resemble those more imperfect contractions which occur in many women at the catamenial periods, and which we do not hesitate to refer to the ovaria. I believe there are some facts which do not admit of explanation upon the supposition that the cause of labour depends on the maturity of the ovum; as, for instance, the occurrence of uterine contractions at the end of gestation in cases of extra-uterine fœtation; while I believe, on the contrary, that the facts which appear to militate against the ovarian theory, do most of them admit of explanation.

In a practical point of view, we may consider that the average duration of pregnancy is about 280 days from the date of the last catamenia, or about 274 or 275 days from the time of coïtus, when this can be ascertained. As the date of fruitful intercourse can only be known in rare and exceptional cases, we are compelled in practice to date from the last catamenia—the point which, from time immemorial, has been the foundation of the calculations of women and their attendants. I constructed the PERIODOSCOPE upon the data that conception generally occurs a few days after the completion of a catamenial period, and that labour may be expected on some day of what would have been the tenth period, had pregnancy not intervened. I have now for some years used this instrument in practice, and found the results generally correct. It is at the same time a mode of calculation, and a diagram of pregnancy.

Those who calculate from the last menstruation, and those who date from conception, may equally use the periodoscope. The cases in which the date of fruitful coitus can be known are rare, and for practical purposes the few days succeeding the last menstruation must be taken as the date of that event.

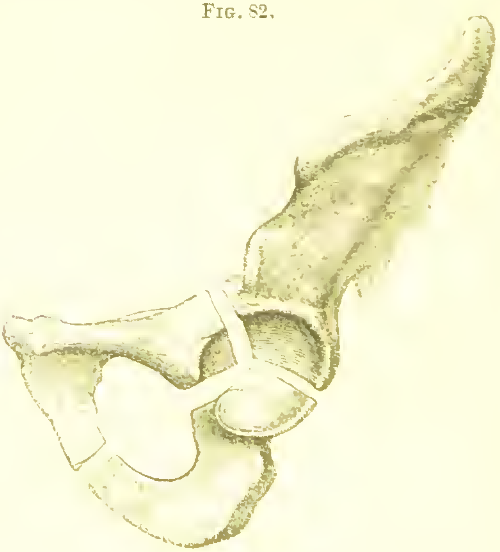
CHAPTER XIX.

THE BONES, ARTICULATIONS, AND LIGAMENTS OF THE FEMALE PELVIS.

THE pelvis consists of four bones, the two Ossa Innominata, the Sacrum, and the Coccyx. In the female pelvis the last lumbar vertebra also requires to be considered in connexion with the above, as contributing to form the framework of the theatre in which the principal events of natural and morbid parturition are performed.

Up to the age of puberty each *Os Innominatum* consists of three distinct bones, the Ilium, Ischium, and Pubis, which are separated from each other at the acetabulum by cartilaginous divisions. (Fig. 82.) After this time the bones become united through the medium of a Y-shaped bony deposit. Epiphyses are also slowly formed upon the crest of the ilium, the anterior and inferior spine of the ilium, the tuberosity of the ischium, and the pubis at the symphysis. These additions increase the size of the bones which form the pelvis, and strengthen the principal points for the attachment of muscles. When the two innominate bones are placed together, they form the anterior and lateral portions of the pelvis.

FIG. 82.



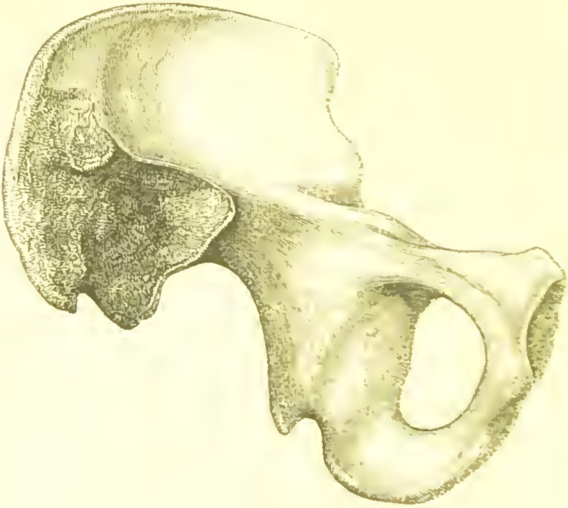
Division between the ischium, ilium, and pubis.

The obstetric points in the anatomy of the os innominatum are numerous and important, but these are of course chiefly confined to the internal surface of the bone. To the crista of the ilium the chief of the abdominal muscles concerned in labour, the internal oblique, external oblique, and transversalis are attached. Other muscles concerned in parturition are attached, the pyramidalis and the rectus abdominis to the tuberosity of the pubis; the levator ani to the pelvic portion of the pubis; and the muscles which contribute to form the perineum to the tuberosity of the ischium. The iliac fossa, covered by the iliacus internus muscle, contributes to the support of the lower segment of the gravid uterus in the latter part of pregnancy, before the head of the fœtus has descended into the pelvis. A line running from the promontory of the sacrum to the tuberosity of the pubis, the linea ilio-pectinea, forms the boundary between the true and false pelvis, or between the cavities of the pelvis and abdomen. This line also marks the greater part of the pelvic brim. At the junction of the ilium with the pubis, a prominence is met with upon the ilio-pectineal line, which is called the ilio-pectineal eminence.

The inferior and slightly everted border of the descending ramus of the pubis, forms, with its fellow of the opposite side, the arch of the pubis. Between the body and ramus of the ischium and the ascending and horizontal portions of the pubis an oval opening, the obturator foramen, is seen. The smooth inner surface of this ramus, and the smooth portion of the internal surface of the ischium, are the surfaces over which the presenting part of the fœtal head glides in parturition, and which give it its direction as it emerges under the pubic arch. The tuberosity of the ischium and the spinous process of this portion of the os innominatum contribute to form the outlet of the pelvis. Behind the spine of the ischium are seen the anterior and superior spinous processes of the ilium, between which the two sciatic foramina are formed. The whole of the three bones entering into the composition of the os innominatum contribute to form about three-fourths of the pelvic brim. (Fig. 83.)

The internal surface of the Sacrum is of great obstetric significance. It forms the posterior part of the pelvic walls, being articulated on either side with the ossa innominata. Above, it is united with the fifth lumbar vertebra, and below with the coccyx. Its upper portion forms, with the last lumbar vertebra and the inter-articular cartilage, the promontory of the sacrum, or sacro-vertebral angle, the angle being formed by the deviations of the line of the lumbar vertebræ, and the line of the upper part of the sacrum. The anterior aspect of the sacrum is smooth and concave from above downwards. The depth of the sacral curve is shown by two lines, one drawn from the promontory to the point of the sacrum, and the other at right angles from this line to the middle of the third sacral vertebra. (Fig. 84.)

FIG. 83.

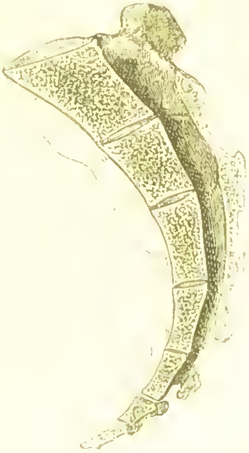


Innominatum.

From side to side, the pelvic surface is less concave, particularly at its extremities, where it is slightly convex. It is marked by four transverse lines, indicating its original division into five rudimentary vertebræ. These divisions exist, the bones being divided by cartilage and inter-vertebral matter, until after the age of puberty, when ossification begins between the lowest portions, and, ascending upwards, the bones become one osseous mass about the age of thirty. It presents on each side four inter-vertebral foramina, for the passage of the anterior branches of the sacral nerves. (Fig. 85.) Besides the great angle or promontory of the sacrum, a lesser angle is formed at the union of the sacrum and the coccyx, when the coccyx is bent backwards at the time of parturition.

The *Coccyx* generally consists of four pieces of bone articulated together until a late period of life, when they become ossified into one mass. These bones continue in the direction

FIG. 84.

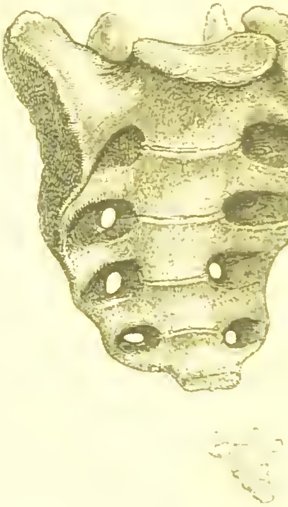


Section of sacrum and coccyx.

of the lower part of the sacral curve, so that they project downwards and forwards, their internal surface being smooth and concave. During the childbearing era the bones of the coccyx move slightly upon each other, and considerably upon the sacrum, with which the first bone is articulated. The first piece of the Coccyx is the only one presenting any marked characters. It presents above, a smooth surface, which is in apposition with the last bone of the sacrum. From the posterior and lateral sides of this surface small cornua project, which rest upon the sacral cornua. Beneath this process a small nodule, sometimes contracted into a foramen, transmits the last sacral nerve. The bones of the coccyx diminish in size from above downwards, so that the last piece is a mere nodule. Attachments exist between the coccyx and the coccygeus muscle, the levator ani, the gluteus maximus, and the sciatic ligaments on each side, and the sphincter ani at its extremity. The coccyx has the power of movement backwards and forwards to the extent of an inch. When moved forwards or elevated, it decreases the pelvic outlet; but when depressed and drawn backwards, it increases its area. This bone is moved forwards by the contraction of the levator and sphincter ani; and backwards by the contraction of the lower fibres of the gluteus maximus, when the thighs are fixed, the coccygeus, and the dilatation of the sphincter ani. The depression of the coccyx is carried, however, to its utmost point by the mechanical pressure of the fœtus as it passes the pelvic outlet.

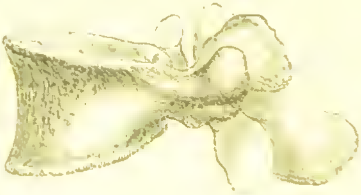
The fifth lumbar vertebra articulates with the upper surface of the sacrum, and contributes, as already mentioned, to form its angle or promontory. This is effected by the lower surface of the last lumbar vertebra being oblique instead of flat, the anterior portion of the body being thus rendered much deeper than the posterior. (Fig. 86.) In cases of deformed pelvis this bone may become of great importance, and the other lumbar vertebræ also may have an immediate bearing upon the pelvis. Through the medium of the lumbar fascia, the lumbar vertebræ give attachment to the transversalis and the internal oblique muscles. Some anatomists consider that the fourth lumbar vertebra also forms part of the false pelvis, in ligamentous preparations, and in the living subject, because of the ligamentous connexion which exists between the transverse process and the crest of the ilium.

FIG. 85.



Sacrum and coccyx.

FIG. 86.



Fifth lumbar vertebra.

The Articulations and Ligaments which unite the bones of the pelvis, not only give the necessary strength to this part of the body, with reference to the support of the trunk and the movements of the lower extremities, but they contribute largely to render the pelvis a *cavity* fitted to contain and preserve the pelvic viscera, and a *canal* for the passage of the fœtus in parturition. The joints and articulations are so arranged that the internal surface of the pelvis is rendered smooth; but externally everything is subsidiary to strength, and numerous prominences are observed. Bony processes, ligaments, and the attachments of muscles are all made to contribute to this object. The whole pelvis may be compared to a nest, in which the rough materials are accumulated on the outside, the cavity being rendered as smooth and even as possible. The joints to be considered are the Lumbo-Sacral, Sacro-Iliac, Sacro-Coccygean, and Pubic articulations: they all belong to that class of joints termed amphi-arthrosis. The ligaments are very numerous, and connect the bones of the pelvis at other points beside those at which the bones are in articular opposition.

The vertebral surface of the sacrum articulates with the last lumbar vertebra, by means of a wedge-shaped mass of fibro-cartilage, the thickest part of the wedge being in front, and increasing the effect of the peculiar slope of the body of the last lumbar vertebra. This cartilage, which resembles in structure the inter-vertebral cartilages, really constitutes the most prominent point of the promontory of the sacrum, as it is termed. That is to say, if the finger be introduced into the vagina for the purpose of examining the capacity of the pelvis, the projecting point of the upper and posterior part of the brim is felt at the anterior part of this cartilage. The common anterior vertebral ligament passes in front of the lowest lumbar vertebræ, and extends downwards over the front of the sacrum and coccygeal bones. The transverse process of the last, and, according to some authorities, the fourth, lumbar vertebræ, are connected with the upper and external portion of the sacrum by a thick, short, and strong ligament, called the lumbo-sacral, or sacro-vertebral ligament. With the exception of this ligament, and the shape of the cartilage above described, the ligaments uniting the sacrum to the vertebral column are the same as those connecting the several vertebræ with each other.

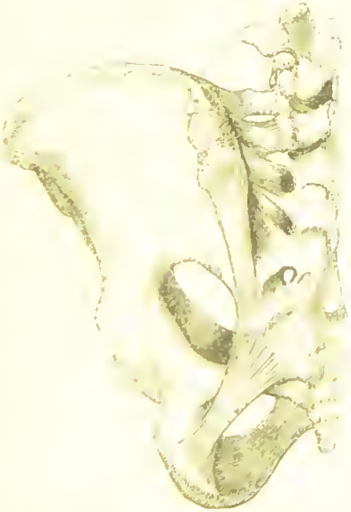
The sacro-iliac symphysis unites the articular surfaces of the sacrum and ilium, both of which are covered by a layer of cartilage presenting numerous inequalities when not in apposition. The sacral layer of cartilage is somewhat thicker than that belonging to the ilium. The union of these bones is strengthened and rendered complete by the ilio-lumbar and the anterior and posterior sacro-iliac ligaments. The ilio-lumbar extends from the transverse process of the fifth lumbar vertebra, and the back of the sacrum, to the crest of the ilium, near the posterio-superior spinous process. The anterior sacro-iliac ligament extends between the anterior surfaces of the ilium and sacrum, in the form of a thin irregular layer. The posterior sacro-iliac is stronger, consisting of several sets of fibres, extending obliquely and transversely from the rough surface of the sacrum to the posterior surface of the ilium.

The coccyx is united to the sacrum by a thin fibro-cartilaginous layer interposed between the articular surfaces of the two bones, and by an anterior and posterior ligament—the latter being of considerable thickness. The small bones of the coccyx are also joined to each other by thin plates of cartilage, and anterior and posterior ligamentous bands. Some anatomists describe the existence of small synovial sacs in cases in which these bones move more freely than usual upon each other and upon the sacrum.

The two Sacro-sciatic ligaments, great and small, require notice in this place. These unite the ilium, the sacrum, and the coccyx to the ischium, and contribute to strengthen the posterior articulations of the pelvis; but they are of more importance as a portion of the canal and outlet of the pelvis itself, than as forming part of the pelvic articulations.

The greater or posterior sacro-sciatic ligament extends from the posterior and inferior surfaces of the ilium and the posterior part of the sacrum and coccyx, to the tuberosity and ramus of the ischium. This ligament is expanded at its extremities, particularly at its posterior attachments. The small or anterior sacro-sciatic ligament extends from the side of the sacrum and coccyx to the spinous process of the ischium. At the sacro-coccygean attachment the fibres of the ligament are in apposition with the middle part of the posterior ligament; but in passing to the spinous processes, the direction of the anterior ligament crosses that of the posterior. The attachment of the anterior ligament to the sacrum and coccyx is broad, but its attachment to the spinous process is smaller, so that the whole ligament is triangular in shape. The space between the anterior and posterior ligaments and the spine and tuberosity of the ischium constitutes the small sacro-sciatic foramen; while the large sacro-sciatic foramen is formed by the sacrum and ilium, and the sacro-sciatic ligaments. The obturator-fascia ligament may be mentioned here, as being concerned in the formation of the pelvis, without any reference to its articulations. It is a fibrous membrane filling up the obturator foramen, except at the upper part, where the obturator nerves and vessels make their exit. The obturator-fascia is connected with the great sacro-sciatic ligament by the process sent up from the tuberosity of the ischium. (Fig. 87.)

FIG. 87.



Sacro-sciatic ligaments and ilio lumbar.

The symphysis pubis consists of the articular surfaces of the pubic bones, an inter-articular cartilage, anterior and posterior ligaments, and the superior, and sub-pubic, or triangular, ligaments. The inter-articular fibro-cartilage is composed of concentric lamellæ. This cartilage itself is imperfectly divided into two parts, one for each osseous surface, frequently containing a viscid pulp in the central space between them. The posterior ligament is the most indistinct; the anterior consists of numerous thick decussating fibres, which cover the symphysis. The superior pubic ligament consists of ligamentous fasciculi, which fill up the small space between the bones above the inter-articular cartilage at the upper part of the symphysis. The sub-pubic or triangular ligament is the most important. It is thick and crescent-shaped, attached to the descending rami of the pubis and the lower part of the inter-articular cartilage. Its inferior border is smooth and arched, contributing to form the angle or arch of the pubis, one of the great obstetric points of the pelvis.

With the exception of the coccyx, the movements of the bones of the pelvis upon each other in the unimpregnated state are extremely limited. Some authorities have maintained that during labour all the pelvic symphyses are relaxed to a slight extent, while others have believed that the joints remain entirely unaltered at this time. This supposition led to the now abandoned operation of Sigault, for the division of the symphysis pubis in cases of contracted pelvis. Some have even believed that during gestation osseous matter is absorbed from the pelvis and carried into the circulation to supply the wants of the fœtus. Others contend that no change whatever occurs in the bones or joints of the pelvis in the course of pregnancy and parturition. We know, however, as Denman pointed out, that in rare cases the sacro-iliac and pubic articulations become so relaxed as to cripple the subjects of this affection for a considerable time after labour. It is also known from dissections of women dying during or immediately after labour, that the cartilages of the joints of the pelvis are found to be softer and more vascular than usual at this time. Many of the lower animals are unable to support themselves firmly in the standing position previous to and during parturition, in consequence of a relaxation of the joints of the pelvis; and Mr. Robertson has pointed out that in the guinea-pig, the pubic symphysis is widely separated at the time of labour, to admit of the passage of the young. These facts afford good reasons for believing that in many cases a slight amount of relaxation of the pelvic articulations does take place in the human female during delivery. The attachments and action of the abdominal muscles are such, that during the expulsive stage of labour the outlet of the pelvis becomes slightly enlarged.

Perhaps no part of the human skeleton, rife as the whole is with adaptations, evinces more evidences of design than the bones of the female pelvis. The progress of ossification shows this in an eminent degree. Up to the time of puberty the cartilaginous division between the ilium, ischium, and pubis is complete. Under the stimulus of the ovaria, the pelvis enlarges considerably at, and previously to, the occurrence of the catamenia, and the separation of the bones which compose the pelvis greatly facilitates those operations of growth, by which its cavity is expanded to the mature standard. In the other parts of the body there is no instance of any such sudden change after the time of birth, not even in dentition, as that which occurs in the pelvis and its contained organs during the two or three years in which puberty is prepared for and completed. The development of the sterile girl into the fruitful woman is almost as striking as the metamorphoses which occur in the lower orders of creation. All the changes of this epoch have for their great object the preparation of the organism for the functions of impregnation and childbearing. Of these, the expansion of the bones of the pelvis, before the union of the three parts which compose the os innominatum, the bony deposit between the pubic bones at the symphysis pubis, the slow union of the bones of the sacrum, the formation of the numerous epiphyses which enlarge the pelvis and contribute to its strength at and before the era of puberty: and the ossific union of the different parts of the coccyx and of the whole bone with the sacrum, only after the function of childbearing has altogether ceased, are amongst the most remarkable.

CHAPTER XX.

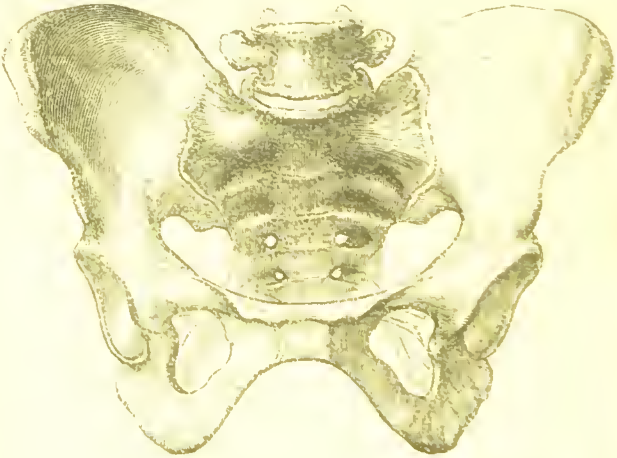
THE PELVIS.

The individual bones and ligaments which enter into the composition of the pelvis having received a detailed notice, attention will now be directed to the interior of the pelvis, and to the normal relations of the salient osseous points of its exterior anatomy. Under the first head will be included the Pelvic Planes, Axes, Angles, Diameters, and Canal, while the second will refer to certain external measurements, a knowledge of which is necessary to a ready diagnosis of special internal malformations, or general alterations of dimension and configuration. I have reserved the consideration of the pelvis to the present time, instead of introducing it into the early part of the work, in order to connect it with the anatomy of the Fœtal Head, and the Mechanism of Labour, which will form the subjects of the next two chapters.

As already stated, the pelvis is divided into two parts, a false and a true pelvis, the first situated above, and the second below, the linea ilio-pectinea. (Fig. 88.) The relations of these divisions of the whole pelvis to utero-gestation and parturition are very unequal, and in cases where the false pelvis is malformed, the distortion of the true pelvis co-exists to such an extent as to render the deviations above the brim comparatively unimportant. We must look for the interest of the false pelvis, not in its immediate relations to the passage of the fœtus through the pelvic canal, but in its functions as the supporter of certain viscera, as a fixed point for the action of numerous muscles concerned in parturition, and as a tolerably correct indicator of the condition of the true pelvis.

The true pelvis, or *bassin petit*, as it is termed by French obstetricians, is situated below the linea ilio-pectinea, which circumscribes its superior orifice or inlet, and has its inferior opening or outlet, bounded in part by osseous, and in part by ligamentous structures. In the middle line posteriorly, the outlet is formed by the coccyx, and by the great sacro-sciatic ligaments laterally and behind; the tuberosities of the ischia are its extreme lateral boundaries, and the conterminous rami of the ischia and pubes form its antero-lateral confines. The canal of the true pelvis lies between the above limits, and within this canal are situated the rectum, bladder, and ureters:

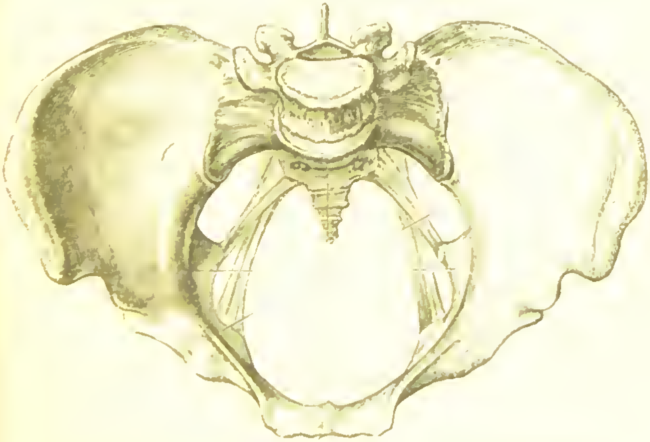
FIG. 88.



the internal iliac arteries and veins, with their subdivisions; the lymphatics; the sacral plexus in whole, and the lumbar plexus in part; and certain muscles, visceral and femoral. In the unimpregnated female, it also contains the uterus and ovaries, and during utero-gestation, a varying portion of the lower portion of the gravid uterus and its contents.

The Diameters of the pelvis are measurements taken in the three planes which have been described. The other dimensions necessary to be known are the depths of the pelvis at different points, and the distances between several of its spines and tuberosities. Beginning with the diameters of the superior plane or inlet, we have the long or transverse diameter, the antero-posterior or conjugate diameters, and the right and left oblique diameters. In the mid-plane we have the same diameters to consider, but the oblique is now the long diameter. In the inferior plane, the longest of the diameters is the antero-posterior. In referring to the statements of the most eminent authorities, an immense variety of measurements will be found, but the range of variation, with few exceptions, is not very great; and with regard to the greatest extremes, nothing is met with that does not probably result from the accidental omission or admission of very large or very small pelves into the calculation.

FIG. 89.



Brim of pelvis. Transverse, oblique, and antero-posterior diameters marked.

The depth of the pelvic cavity or canal varies greatly in different parts of the pelvis. Behind, it measures from five to six inches from the sacro-vertebral angle to the point of the coccyx; from the linea ilio-pectinea to the tuberosity of the ischium, three inches and three-quarters; and from the crest of the pubis to the pubic arch, from an inch and a half to two inches.

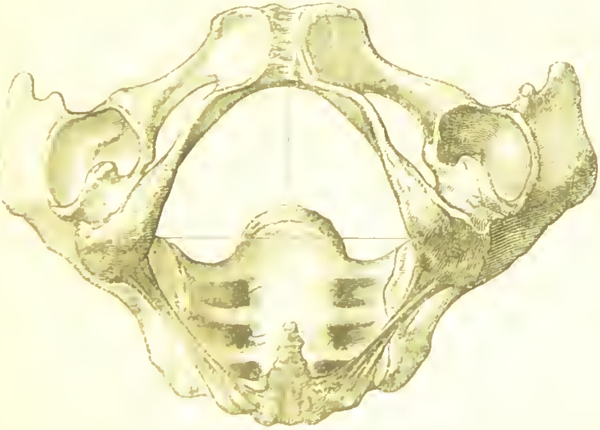
At the brim of the pelvis, the antero-posterior diameter, from the sacro-vertebral angle or promontory, to the crest of the pubis, measures four inches in the dried state. The transverse diameter measures from about four inches to five inches and a quarter. The measurement of the oblique diameter from the sacro-iliac symphysis to the ilio-pectineal eminence, is from four and a half to five inches. In the cavity of the pelvis, from the middle of the sacrum to the pubic symphysis, the antero-posterior diameter is as nearly as possible four inches and a half. The oblique diameter, from the middle of the great sacro-sciatic foramen to the obturator ligament is five inches. The transverse diameter on the same plane, between the two ischii, is about four inches and three-quarters. At the outlet or inferior strait of the pelvis, the diameters are as follow:—From the arch of the pubis to the extremity of the coccyx, antero-posterior, four inches and a half—but the mobility of the coccyx increases this by nearly an inch; between the sacro-sciatic ligament and the ascending ramus of the ischium, oblique, about five inches; between the tuberosities of the ischii, transverse, four inches. Thus, at the brim the longest diameter is the transverse, the shortest is the antero-posterior. In the middle of the pelvis, the oblique diameter is the longest, and the shortest is the antero-posterior. At the outlet, the antero-posterior is the longest, and the transverse the shortest diameter. (Fig. 90.) When the soft parts are in apposition with the bones, the oblique diameter of the brim is somewhat longer than the transverse. A line carried round the brim of the pelvis measures about fourteen inches.

An average struck from the combined observations of Duncan, Burns, Monro, Meckel, Watt, Velpeau, Moreau, Boivin, Baudelocque, Ramsbotham, Rigby, and Wood, gives us the following results:—

	Transverse.	Oblique.	Ant.-post.	
Superior plane	5·2	4·8	4·25	inches.
Middle plane	4·75	5·2	4·7	
Inferior plane	4·2	—	5·0	

It is this change in the longest diameter of the pelvis, from the transverse to the oblique, and from the oblique to the antero-posterior, which gives to the pelvis the principle of the SCREW—an idea we shall have to develop more at length when we come to the mechanism of labour.

FIG. 90.

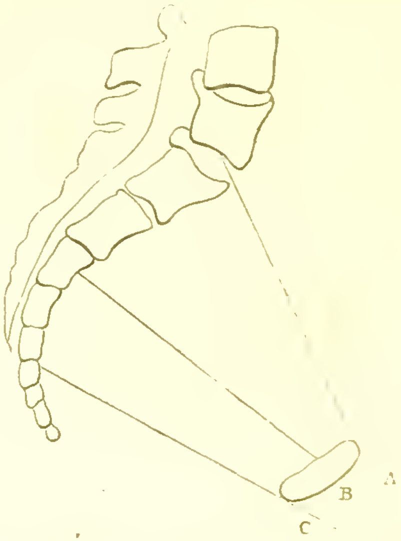


Outlet of pelvis. Antero-posterior and transverse diameters marked.

The Planes of the pelvis are imaginary levels extended between some of its corresponding points, the inclination of which to each other and to the horizon it is important to know. Only two of these planes have been generally deemed worthy of particular attention—namely, a superior and inferior plane, or plane of the inlet and outlet; but it is necessary to consider a third plane, situated between the other two, and which may be termed the mid-plane. To this plane especial study should be directed, because it is here that the rotations of the fœtal head are impressed upon it, and here, under slight deviations from the normal condition, serious obstacles to parturition are encountered. (Fig. 91.)

The plane of the inlet, or superior plane, is bounded by the linea ilio-pectinea, and is inclined to the horizon at an angle of about 60° in the female (Naëgele), and 65° in the male (Weber). That is to say, in the erect posture, and in the unimpregnated condition, these are the inclinations of the pelvic brim, inlet, or superior plane. During pregnancy, and more particularly towards the end of utero-gestation, when the weight of the gravid uterus and enlarged breasts is thrown upon the anterior arms of the levers represented by the *ossa innominata,* the obliquity of the pelvis is diminished by the

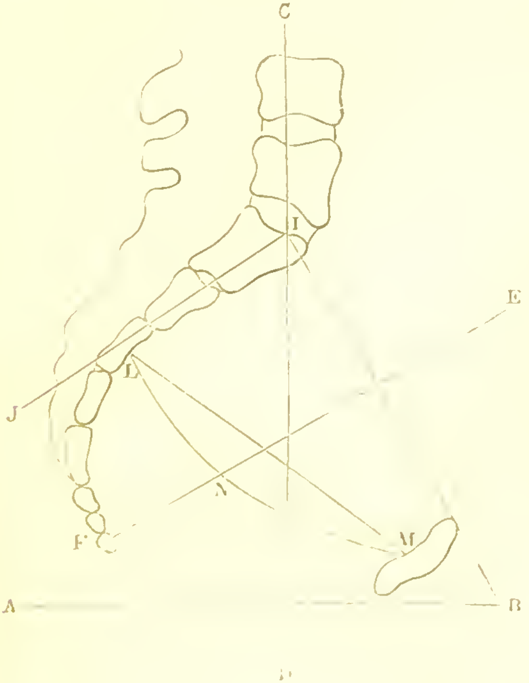
FIG. 91.



A. Plane of the ~~ou~~intlet. B. Mid-plane. C. Plane of the outlet.

involuntary assumption of a position similar to that taken by persons in walking down a hill. The amount of diminution cannot be stated with precise accuracy, as it varies according to the length and flexibility of the spine, as well as the mobility of the sacro-iliac articulations, but it frequently amounts to several degrees. There is an evident adaptation of means to an end in the greater obliquity of the female as compared with the male pelvis, the approach of the internal surface of the symphysis pubis to the horizontal position being manifestly conducive to the support and retention of the comparatively heavy pelvic viscera of the female, and fitted to counteract the tendency to prolapse caused by the greater area of the pelvic canal. This might seem to be contradicted by the diminished obliquity which obtains during pregnancy. The gravid uterus rises, however, out of the pelvic cavity before the obliquity is materially altered, and prolapse thus becomes mechanically impossible, from the increased size and elevation of the uterus, when the ordinary provisions for support cease to be in operation. The elevation of the sacral promontory above the upper margin of the symphysis pubis, in the unimpregnated female, will of course depend partly on the obliquity of the pelvis, and partly on its dimensions. In the well-formed female pelvis, it is usually from three inches nine lines to three inches ten lines; and in the upright position, the sacral portion of the brim is a little below the antero-superior iliac spine. It is necessary to study the relations of the superior

FIG. 92.



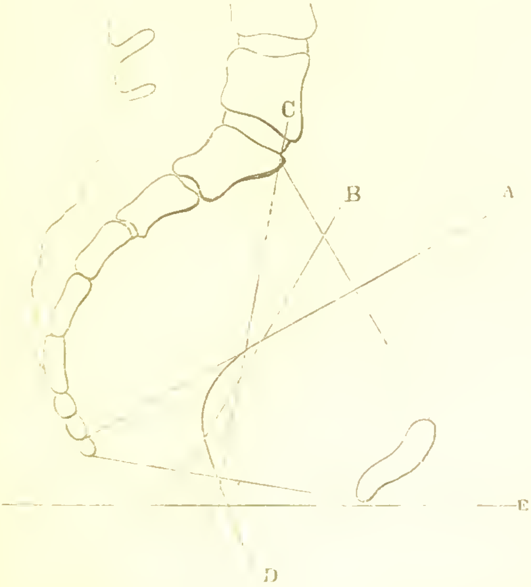
A, B. Horizon. C, D. Vertical line.
A, B, I. Angle of inclination of pelvis to horizon, equal to 60°.
B, I, C. Angle of inclination of pelvis to spinal column, equal to 150°.
C, I, J. Angle of inclination of sacrum to spinal column, equal to 130°.
E, F. Axis of the inlet.
L, M. Mid-plane in the middle line.
N. Lowest point of mid-plane at the spine of the ischium.

plane of the pelvis to the spinal column. The pelvi-vertebral angle—that is, the angle formed between the superior plane of the pelvis, and the lumbar portion of the spine, forms an angle of about 150°. This angle varies slightly in different individuals, but is diminished somewhat by the anteflexion of the spine, and drawing up of the inferior extremities, which obtains in the obstetric position. The study of the above particulars may be facilitated by means of a diagram. Fig. 92.)

The mid-plane, or strait, of the pelvis, unlike the superior plane, is not bounded by a line, all the points of which lie in the same plane, and the term plane must not be taken therefore in an exact and mathematical, but in an obstetric and conventional sense. Its boundaries may be stated as follows: —Commencing at the symphysis pubis anteriorly, at about the level of the upper margin of the obturator foramen, it crosses the obturator membrane immediately below the point of exit of the obturator nerve and artery; from thence it descends the spine of the ischium along the oblique ridge on the inner surface of that bone. It then traverses the lesser sacro-sciatic ligament, and ascends to the level of the lower portion of the third piece of the sacrum. The curve L X M represents a section of the plane in the mesial line. Its lowest point is indicated by the letter X, and this corresponds to the apex of the ischial spines. The general inclination of this plane to the horizon is considerably greater than that of the superior plane —in other words, it makes a less angle with the horizon, the difference being about 30°. The importance of the study of this plane will be more particularly dwelt on when speaking of the canal of the pelvis.

The inferior plane, plane of the outlet, or inferior strait, is commonly described as extending between the lower margin of the symphysis pubis anteriorly, and the tip of the coccyx posteriorly. There are, however, valid reasons for dismissing the coccyx from our calculations on this head: for being moveable, and potentially endowed with elasticity through the medium of its connexion with the perinæum, any influence it exerts upon the progress of labour partakes of the nature of a force applied from without, and differs *toto cœlo* from the rigid resistance of all other parts of the pelvis. The motion enjoyed by the coccyx is so great, that before it has reached its limit it ceases to influence the antero-posterior diameter of the outlet, and the mechanical conditions under which the fœtal head escapes from the pelvis are then imposed by the apex of the sacrum. This is proved by the following measurements:—In a large female pelvis, the antero-posterior diameter of the outlet, measuring from the tip of the sacrum, is 4·5 inches, and from the tip of the coccyx, 3·625. The amount of motion enjoyed by the coccyx equals one inch—that is to say, the coccyx can be pushed back one inch from its ordinary situation by the pressure of the fœtal head and the action of the muscles in connexion with the coccyx. If we add this inch to the ordinary diameter, 3·625, we have 4·625 as the distance from the tip of the coccyx to the lower border of the symphysis pubis. As this is greater than 4·5 inches, the distance from the last-mentioned point to the extremity of the sacrum, it is clear that the sacrum, and not the coccyx, bounds the outlet of the pelvis, and determines how large a body shall pass out

FIG. 93.



A. Axis of superior plane. B. Axis of mid-plane.
C. Axis of inferior plane. D. Axis of canal.
E. Horizon.

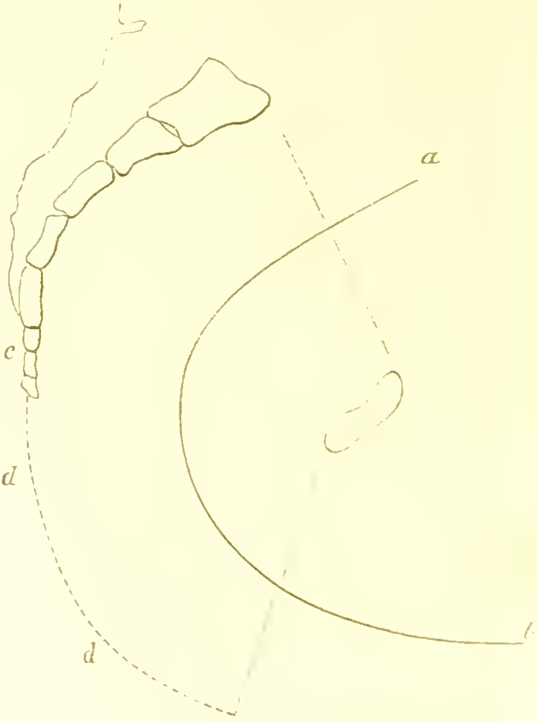
of it. The inclination of the plane of the outlet to the horizon, if the measurement to the tip of the coccyx be taken, is, according to Naëgele, from 10° to 11°. If the tip of the sacrum is taken as the osseous limit posteriorly, the inclination will not of course be so great, the angle being in this from 15° to 16°. The planes of the pelvis meet, if prolonged anteriorly, about 1·5 inch in front of and below the symphysis pubis. These several planes, it must be borne in mind, vary in their relations to the horizon and to the spinal column, but constantly preserve the same relations between themselves. The sacro-iliac articulations are not free enough to allow of any variation in the pelvic planes. As a corollary to this, it follows that the axes of the planes of the pelvis must be fixed and determinate, and the course of the fœtal head under normal conditions must be fixed and determinate also.

The Axes of the pelvis are certain imaginary lines, drawn at right angles to the several planes of the pelvis. The axis of the superior plane or axis of the inlet, if extended or prolonged superiorly, will pass through the umbilicus, and, inferiorly, will impinge upon the anterior surface of the coccyx, near its point. This line makes with the horizon an angle of about 30°. The axis of the mid-plane, if produced inferiorly, will fall upon a point rather nearer to the anus than half the distance between the anus and the tip of the coccyx; and superiorly, will issue some inches above the umbilicus. The angle made with the horizon by this line is about 50°. The axis of the outlet, when the point of the coccyx is not displaced by the egress of the fœtus, falls from the promontory of the sacrum to midway between the tuberosities of the ischia, or to the anus if continued through the soft parts. The angle made by this axis with the horizon is about 80°. But, as already stated, it is better to consider the axis of the outlet as the axis of a plane extended between the inner margin of the symphysis pubis and the apex of the sacrum. Such a line would emerge, superiorly, a little in front of the sacral promontory, and, below, would fall a little behind the anus. There would also be a small diminution of the angle made by the axis of the outlet with the horizon. This represents the actual state of things during labour, when the coccyx is moved back, and the differences just enumerated necessarily follow. (Fig. 93.)

These axes are all of them of importance chiefly as they bear upon the true axis of the pelvic canal, which represents the path traversed by the fœtus in its passage from the maternal nidus to the external world. The axis of the canal is a subject upon which many diverse opinions have been held, and most of them evidence a wish for diagrammatic perfection rather than a patient observation of Nature. The study of the axes of the planes of the inlet and outlet alone, has led to much incorrect opinion, the axis of the canal being held to be identical with the axes of these two or three planes; whereas, the axis of the canal is identical with every imaginary intermediate plane from the inlet to the outlet, at the point where the axis cuts the plane. One observation will show the fallacy of representing the axis of the canal by the axes of isolated planes. The axis of the outlet of the pelvis only, and the axis of the whole of the lower part of the pelvic canal, are usually confounded together, whereas they are totally distinct. The axis of the outlet is downwards and backwards, being at right angles with the inferior pelvic plane, while the produced inferior extremity of the axis of the canal, being the axis not of one plane but of all, looks downwards and forwards. It is difficult to conceive how such men as Müller and Rœderer should have fallen into the error of making the pelvic axis a right line. Baug, Choulant, Carus, and Camper represent it by means of an *arc de cercle;* and the circle of Carus finds favour at the present time with many obstetricians. Camper is, perhaps, the model of a mind addicted to diagrams; and, as is well known, he fell into diagrammatic vagaries about other things than obstetrics.

A rougher idea, again, of the direction of the pelvic axis could hardly be given than by endeavouring to express it by the meeting of the axes of the inlet and outlet; yet this is held by some. Levret caught a glimpse of the truth when he proposed to represent the value of the pelvic curve by perpendiculars drawn from three planes. Had he said thirty or three hundred planes, he would have been nearer the fact, the axis of the pelvis being in reality, as already stated, a curved line, passing through the centre of every plane between the plane of the inlet and the plane of the outlet. Of all recent authors, Dubois leaves least to be wished for in his description of the pelvic curve. We must be careful not to disjoin the curve of the pelvis from its connexion with other parts through which the fœtus passes. This curve is only complete when we have added to it the axis of the uterus above and of the distensible soft parts below. Collectively, the parturient line is expressed by an irregular parabolic curve, fixed from the brim of the pelvis to a line drawn from the inferior margin of the symphysis pubis to the apex of the sacrum, but variable above, from the fundus uteri to the pelvic inlet, and below from the outlet to the margin of the perinæum, according to the position of the uterus, and the facility with which the coccyx is pushed back or the perinæum distended.

FIG. 94.



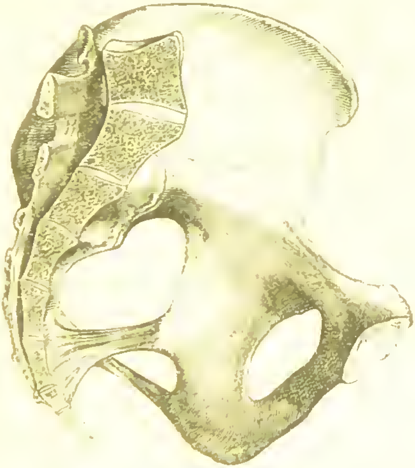
a. b. Axis of the path of the fœtus through the pelvis.
c. Coccyx. *d, d.* Distended perinæum.

The study of the axis of the inlet and of the outlet of the canal has important practical bearings. In order that the uterus may act with the greatest efficiency in the first stage of the labour, where the motor force is required in the direction of the axis of the inlet, it is necessary that the axis of the uterus should correspond with the axis of the inlet. If the gravid uterus be anteflected or retroflected from the true position, the progress of labour is impeded. If the axis of the uterus approaches the horizon, the fœtal head is impelled against the promontory of the sacrum; if it approaches the perpendicular, it is urged against the pubis. The derangements of the axes of the uterus and pelvis have the same effect as distortion of the brim, only the difficulty is easily remediable. By bending the spine upon the pelvis, as in the usual obstetric position, we may depress the axis of the uterus; and, on the other hand, if it requires to be raised, it is necessary to support the uterus with a bandage, or place the patient on her back. It is necessary that we should recognise the direction of the axis of the outlet in examinations; in introducing the hand into the uterus; in assisting the birth of the head; and in all traction in midwifery operations of every kind.

The Canal of the pelvis is the most important matter in relation to this assemblage of osseous structures, and it is especially necessary to consider the walls of this canal, and the direction taken by the different portions of the pelvic parietes. It may be observed that the inner surface of the pelvis is made up of a number of smooth inclined planes, and that the inclination of these planes is so arranged as to accomplish two principal objects: the one, a gradual alteration of the direction of the longest diameter of the canal; the other, a more sudden change in the direction of the planes themselves. Between the superior and middle planes of the area of the pelvis, we may observe in the pelvic walls of the inlet four inclined planes: of these, one is formed by the whole of the internal surface of the body of the pubic bones; and a second, by the upper half of the sacrum. The direction of both these inclines is downwards and backwards. The two other inclined planes are placed laterally, and are composed of the ilia and ischia, terminating in the spinous processes of the latter. The direction of these lateral planes is downwards, backwards, and inwards, so that at the spines of the ischia the walls of the pelvis approximate to each other more closely than they do at the commencement of the superior lateral planes, below the linea ilio-pectinea. The inclined planes of the outlet, as far as the bony pelvis is concerned, may be said to be five in number; one posterior and four lateral. The direction of the posterior, consisting of the lower half of the sacrum and the adjacent portions of the sacro-sciatic ligaments, is also downwards and forwards. Of the lateral inclined planes of the outlet, two, consisting of the internal surfaces of the ischia, below the level of the spinous processes, terminate in the tuberosities, and are directed downwards and forwards, and slightly inwards. The other two lateral planes of the outlet are formed by the descending rami of the pubic bones, and the ascending rami of the ischia; they extend from the middle of the arch of the pubis to the tuberosities of the ischia, their direction being upwards, forwards, and inwards. If we considered the bony pelvis as a complete canal, it would be pinched inwards at the points of the ischial spines and tuberosities of the ischia, and bulged outwards at the sites of the great sacro-sciatic foramina. These circumstances, together with the shallowness of the anterior, or pubic portion, contribute to alter the diameters of the superior, middle, and inferior planes. The key to the pelvic mechanism, in an obstetric sense, may be said to be the spinous processes of the ischia. Here it is that the fœtal head makes its most decided change of position. The changes of position and direction which bring the fœtal head to occupy, at the outlet of the pelvis, the right oblique position, as the most common presentation, are effected mainly by the anatomical adaptations of the pelvis, aided by the mechanism of the fœtus, and the position of the rectum in the notch by the side of the sacrum on the left side. (Fig. 95.)

The normal depth of the female pelvis is, according to Burns, as follows:—From the promontory of the sacrum to the tip of the coccyx, from 5 to 6 inches; from the brim to the tuberosity of the ischium, 3·75 inches; anteriorly, from 1·5 to 2 inches. The variations which obtain in this respect exercise a considerable influence upon the progress of labour. Deep pelves are often somewhat funnel-shaped, and shallow pelves are not merely wide in appearance, but wide in relation to the size of the body. If a pelvis be very much shallower than usual, the points of resistance to the passage of the fœtal head are of course diminished in number, and the track of the fœtus is materially shortened also: labour, under these conditions, is unusually rapid, unless there is co-existent distortion. It is well to bear in mind, that the shortest pelvic diameter is that between the two ischial spines (3·5 inches), and the longest is an oblique diameter, extending between the sacro-iliac synchondrosis of either side to the tuberosity of the

FIG. 95.



Side view of pelvis.

ischium opposite. This line is 6 inches in length, and corresponds very nearly in position with the long axis of the fœtal head in an ordinary occipito-anterior presentation, when the head is fairly lodged in the cavity of the pelvis.

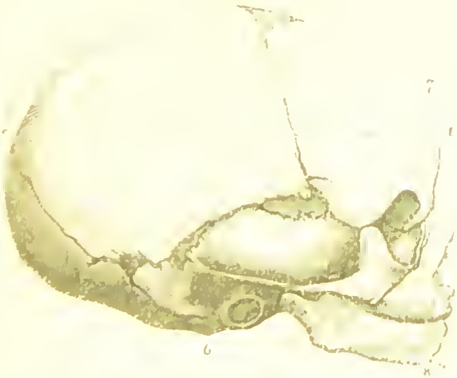
With regard to the External Measurements of the pelvis, it may be stated that the same method of ascertaining the antero-posterior, lateral, and oblique diameters, will assist us in understanding the external diameters. The antero-posterior diameter of the pelvis, externally, is about eight inches; the external transverse—i.e., from crest to crest of the ilia—about 11 inches; the oblique—i.e., from the antero-superior spine of one ilium to the postero-superior of the other—about eight inches. These diameters are all in the same plane. There are other diameters in various planes, a knowledge of which is useful. For instance, from the spine of the last lumbar vertebra to the antero-superior spine of either ilium, 6 inches 7 or 8 lines; from the symphysis pubis to the infero-anterior spinous process, about 4 inches; from the tuberosity of either ischium to the postero-superior spine of the ilium of the opposite side, 6 inches 6 lines; from the great trochanter of either side to the postero-superior spine of the ilium of the opposite side, about 8 inches. These measurements are valuable, not because we can determine from them the internal pelvic diameters, but because, unless the proportionate dimensions stated above are maintained, there must necessarily be an alteration in the size of the pelvis, or serious distortion. When speaking of deformed pelves, it will be pointed out how the diminution of each of these diameters is indicative of certain mal-relations between the pelvic bones.

CHAPTER XXI.

THE ANATOMY OF THE FŒTAL HEAD.

The anatomy of the fœtal head, and the anatomy of the pelvis, are the elements of obstetric mechanics; and the behaviour of the former in the cavity of the latter, will, of course, depend upon the mutual relations of each. It is to the cranium of the fœtus, however, that our attention is now directed. Speaking, in general terms, the head of the fully-developed fœtus is an irregular ovoid mass of very various diameters, and various compressibility, according to the diameters in which the compressing force is applied. It is attached to the neck in such a manner as to project posteriorly more than anteriorly; and it rotates upon this point of attachment to the extent of a quarter turn without any harm accruing to the infant. The bones of the head may be arranged into two systems: one, the bones of the cranium: and, the other, those which compose the face and base of the skull. The bones of the face and base of the skull differ from those of the calvarium in being far more highly ossified: they are, in fact, so advanced in development as to be practically unyielding: and the adaptations, therefore, which exist between the configuration of this part of the fœtus and the maternal skeleton are obtained either by the slight compressibility of the soft parts of the fœtal face, or by special morphological conditions of the bones themselves. The bones of the face and base of the skull are early developed, and unyielding in their texture, in order to protect the delicate organs of special sensation and important ganglia at the base of the brain from the injurious effects of mechanical violence during labour. The hemispheres of the brain, performing functions the integrity of which is less necessary to life, require no such protection, and submit to considerable compression within their moveable case. It is interesting to remark, that the immovable portion of the bones of the head occupies such a position that a moderate force of compression applied to the opposite aspect of the cranium tends rather to increase than to diminish its capacity; according to the well-known law which provides that a spherical vessel contains greater bulk in proportion to its superfices than any other form of receptacle. The lower jaw in the fœtus is widely different from an adult maxilla: the ramus is short and oblique, and the empty alveoli of each jaw are thus permitted to come into actual contact, whilst the body of the bone is shallow; and thus, by a combination of provisions, the fronto-mental diameter is kept within convenient limits. Were the chin pronounced, and the fronto-mental diameter consequently much increased, it would, in ordinary presentations, almost inevitably strike against the right side of the promontory of the sacrum, and prove an insuperable obstacle to the movement of rotation taken by the head in its descent through the pelvis. The diameters of the facial portion of the head are its smallest diameters, and adapt

FIG. 96.



1, 2. Occipito-frontal diameter. 3, 4. Occipito-mental. 5, 6. Cervico-bregmatic. 7, 8. Fronto-mental.

themselves to the smallest diameters of the pelvis. Thus the bi-temporal diameter, which is variable to a very slight extent, is little more than two inches and a half, the bi-malar diameter is barely three inches, and the bi-mastoid is not much over two inches. These diameters all pass through the cavity of the pelvis, between the spines of the ischia, in ordinary occipito-anterior presentations, as well as in those cases where the occipito-posterior presentations have passed into the former. The unyielding portion of the head might be represented by an oval plane, having one end at the back of the neck, and the other somewhat above the brow, while its conjugate diameter would nearly correspond with a line passing through the skull from ear to ear. It is evident that whatever error an obstetrician might fall into as regards the actual position of the head, from failing to take into account the moulding the calvarium undergoes *in transitu*, none can arise from this source as far as the face and ears are concerned. In cases of distortion or contraction, then, it follows that a recognised ear, or cheek-bone, will be a better index to the actual position of the head than any point in its more moveable part. Dr. Hamilton was of opinion that the compression of the cerebral hemispheres during labour produced a paralysing effect upon the limbs of the fœtus, and tended to keep them motionless under the action of the uterus—an opinion shared in by Dr. Ramsbotham, but which is probably without foundation.

That part of the head which is called the skull-cap consists of the occiput, the parietal bones, and the frontal bones; the temporal bones scarcely require to be noticed. In the vast majority of cases, these bones are soft and semi-cartilaginous, and connected to each other only by the dura mater and scalp; their continuous edges are bevelled off, and they may be made to overlap each other to a very considerable extent. Between the edges of contiguous bones are grooves called *sutures;* and where three or more sutures meet, there is a deficiency of bone, called a *fontanelle.* The arrangements for solidity in the face and base of the skull are not more conspicuous than the provisions made for plasticity here; in whatever direction compression is applied, it results in a modification of the contour of the head, partly because the bones bend, and partly because they overlap in various directions. As a general rule, it may be laid down, that in ordinary presentations the longer the head remains in the pelvis, the more ovoid will it become, always provided that the pelvis is not absolutely deformed.

There is a considerable discrepancy between the estimates of dimension given by various writers. Dr. Meigs is very positive in affirming that the estimate usually given of the occipito-frontal and occipito-mental diameters is far too low. It is not unlikely that much may depend upon the period when the measurements are taken, for certainly the cranium of a fœtus, immediately after what is vulgarly called a "hard labour," is materially longer than twenty-four hours later, and, it may be presumed, than before it has been subjected to the modelling process by which it attains its adaptation to the maternal passages. Confining ourselves, however, to average figures, which shall represent rather the relative diameters of the fœtal head, than an exact estimate of each individual measurement, the following table may be relied upon as sufficiently accurate for all practical purposes. The really important consideration is not the absolute, but the relative, admeasurements of the skull; we are utterly unable, in any given case, to determine the magnitude of the body about to pass, and are therefore compelled to frame our mechanical appliances upon considerations of proportion.

1. The occipito-frontal diameter ...	4·5	inches	to 4·75
2. The occipito-mental	5·0	,,	,, 5·25
3. The cervico-bregmatic	3·75	,,	
4. The sub-occipito-bregmatic ...	3·25	,,	
5. The transverse or bi-parietal ...	3·5	,,	
6. The fronto-mental	3·25	,,	

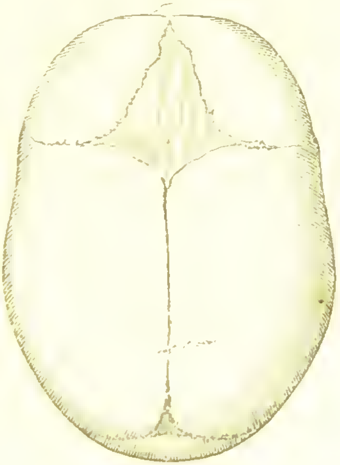
It will be observed that the two first of these measurements are particularly noticed as varying, and they do, in fact, vary as labour advances, being the directions in which the greatest range of alteration is admissible. The circumference of the head varies, of course, according to the direction in which it is taken. Thus, the ordinary presenting circumference, which passes under the occiput, and round the parietal bones, to a little behind the bregma, is about 11·5 inches, the occipito-frontal is rather more than 14 inches, and the occipito-mental is nearly 16 inches. It is unnecessary to burden the memory with any further details on this head.

The sutures with which we are mainly concerned are the coronal, the sagittal, and the lambdoidal; the temporal sutures between the temporal bones and the inferior concave border of the parietal bones are comparatively uninteresting, because the ear is quite as easy, if not easier, to recognise in all cases where it is desirable to know the position of that part of the head. The coronal suture—so called because the ancients wore their triumphal crowns in that position—is the line of demarcation between the frontal and parietal bones; it extends transversely, and almost vertically, over the head, from the summit of the squamous portion of the temporal bone on one side, to a corresponding point on the other side; its line is broken by the great or anterior fontanelle. The sagittal suture projects directly backwards from the coronal in the middle line, and lies between the opposed superior borders of the two parietal bones; posteriorly it abuts upon the apex of the lambdoidal suture. The lambdoidal suture — so called from its resemblance to the Greek Λ—is formed by the opposed borders of the occipital and parietal bones: if two parietal bones are placed *in situ*, it will be seen that, owing to the obliquity of their posterior borders, an angular recess is formed where they meet; into this recess the occipital angle fits, and just between the superior angle of the bone and the angular recess alluded to, is the small or posterior fontanelle. There is a suture between the two divisions of the frontal bone which varies in width, but is always recognisable where it abuts upon the great fontanelle; the sagittal, coronal, and lambdoidal are, however, the important sutures, and of these the sagittal is paramount.

The fontanelles are spaces between some of the cranial bones, into which the sutures debouch. British obstetricians generally take cognisance only of two—an anterior or greater, and a posterior or lesser. Continental writers speak of two others—the temporal; but as the finger could hardly impinge upon them unless the orbit were within reach also, it appears unwise to divert attention from the more to the less valuable aid to diagnosis. The anterior or greater fontanelle, or bregma, is a rhomboidal space into which two fingers may be easily laid: its long diameter is from before backwards, and the greater half of the rhomboid is in front of its lateral angles. The sagittal suture joins its posterior angle, the inter-frontal enters its anterior angle, and the two halves of the coronal suture debouch into its lateral angles. The posterior or lesser fontanelle is small and triangular: it receives the sagittal suture into its anterior angle, and the two limbs of the lambdoidal suture into its lateral angles. The posterior fontanelle is the one with which it is most necessary to be familiar.

However easy it may seem at first sight to determine which suture or which fontanelle is touched in any given examination,

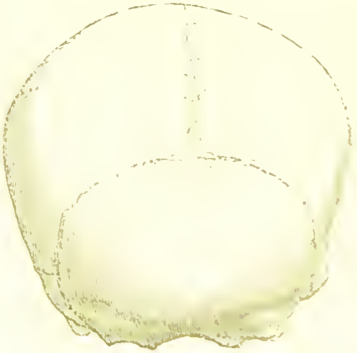
FIG. 97.



Anterior and posterior fontanelles.

beginners are very often mistaken, and there are some circumstances which may embarrass others than tyros. It may be as well to point out a few distinctions between each suture and each fontanelle. The sagittal suture may be recognised by its debouching into *two* fontanelles; the coronal by its joining a large fontanelle at one end, and leading to a more unyielding part of the cranium at the other; the lambdoidal by its joining only the small fontanelle. The anterior and posterior fontanelle, if they should happen to approximate in size to each other, may yet be distinguished by the anterior having four angles, and its four sides bounded by bony margins, which do not project into the space; while the posterior has but three angles, and the bones around it are the three acute apices of the occipital and two parietal bones. There is occasionally a false fontanelle in the course of the sagittal suture, the result of defective ossification in the opposed edges of the two parietal bones; if it is borne in mind, however, that only two lines of suture can be traced from such a space, it cannot be a source of any great difficulty. Before the membranes are ruptured, it may be somewhat difficult, when they are tough, to appreciate all the points of difference between the sutures and fontanelles; sometimes ossification is so abnormally advanced or delayed as in a measure to destroy the characteristics of the fontanelles; and when the bones of the head overlap each other very much during its passage through the pelvis, it may be matter of great difficulty to recognise anything very distinctly. The greatest difficulty in the way of accurate diagnosis is presented perhaps in those cases in which the membranes have been ruptured early, and the head has been long in the pelvis, tightly girt by a rigid cervix uteri. Under these circumstances, the scalp becomes swollen, puffy, and infiltrated with serum and sometimes blood, and nothing can be felt distinctly through it; it may be almost impossible to pass the finger beyond the puffy tumour, so as to reach a part of the head covered by natural scalp, and such cases have been mistaken ere now for breech presentations.

FIG. 98.



Bi-parietal diameter: sagittal and lambdoidal sutures, with posterior fontanelle.

There are some general considerations connected with the size of the fœtal head which are worthy of attention. In the first place, it must be remembered that the average dimensions of the male fœtal head are considerably greater than those of the female; the excess in the circumference which most commonly presents is about half an inch, and this is quite sufficient to make a serious difference both in the chances of danger accruing to the infant and the mother. The question of safety to mother and child is very much a matter of time; whether the delay results from rigidity of the passages as in primiparæ, or from greater size of the head, as when the fœtus is masculine, the result is pretty nearly the same. The late Dr. Joseph Clarke, of Dublin, a very distinguished accoucheur, investigated very minutely the question of the difference of the size in the brain of the two sexes at the time of birth. He ascertained, by the admeasurement of a large number of cases, that the circumference of the male head is greater by half an inch, or about the twenty-eighth part of the entire circumference, than the female head, at the time of birth. The fact that the male fœtal head is actually larger than the female having once been established, all the disastrous consequences of which Prof. Simpson has given statistical proof follow as inevitable. In cases of tedious labour, convulsions, puerperal convulsions, puerperal fever, ruptured uterus, hæmorrhage, and instrumental delivery, by far the greater number of children are males. In cases of pelvic abscess, ruptured perinæum, and vesico-vaginal fistula, the same undesirable pre-eminence attaches to male children. The following are the principal conclusions of Prof. Simpson:

1. Of the mothers that die under parturition and its immediate consequences, a much greater portion have given birth to male than to female children.

2. Of still-born children, a larger proportion are male than female.

3. Of children born alive, more males than females suffer from the morbid states and injuries which result from parturition.

4. More males than females die in the early period of infancy, and the disproportion diminishes from birth to some time afterwards.

5. More dangers occur, both to mother and infant, in first than in subsequent labours.

6. Of children which die *in utero* before labour, as many are females as males.

7. Of the accidents which happen after the birth of the fœtus itself, as many occur with female as with male children.

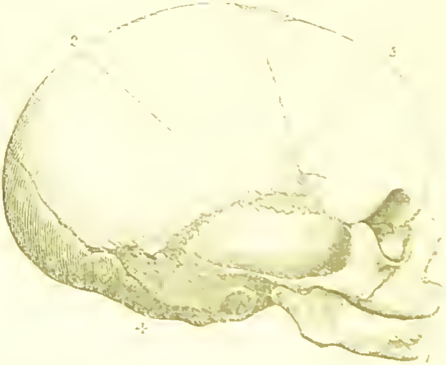
There are other aphorisms on this question, laid down by the same authority, but they are only corollaries of the foregoing propositions, and need not, therefore, be stated.

Besides the effects of sex in modifying the size of the fœtal head, and increasing the pain and danger of parturition to the mother and child, we have to consider the effects of race and civilization upon the head of the fœtus at the time of birth. All ethnological researches tend to show, that, with the advance of civilization, the human head has increased in size. The oldest crania in existence, much older than the mummies of Egypt, are the skulls found in various parts of the world in diluvial caves, with the fossil remains of extinct animals. These skulls apparently belong to other races than those which now inhabit the countries in which they are found; they have a small development of the brain, and resemble the skull of the Carib in flatness of the frontal bone. The heads of Peruvian and Egyptian mummies are considerably below the size of the European cranium. Nothing within the range of human anatomy stands in stronger contrast than the cerebral size and development of the New Hollander, or the Bushman, and the Caucasian races. The different condition of education amongst different classes of the same race also has its effect on the size of the brain and cranium. Hatters state that the size of the head is greater in the same classes in towns, than in agricultural districts, in the educated than the uneducated. Tiedemann gives from 3lbs. 2oz. to 4lbs. 6oz. troy weight as the average weight of the adult male European brain; but he found that of Cuvier weighed upwards of 4lbs. 11oz., and that of Dupuytren 4lbs. 10oz. The same authority gives the average weight of the female brain as from 4 to 8 oz. less than the male: and he found that the different size of the male and female brain was perceptible at birth, in this according with the views of Dr. Joseph Clarke and others. The increase is not confined to the head alone. Dr. Clarke found that, on the average, taking the whole body, males weigh 9oz., or nearly one-twelfth of the entire weight, more than females. It seems a clear inference, that the brain and head of the uncivilized and the uneducated must be, on the average, smaller than those of the educated and civilized; and we have seen, in the comparison of the male and female head at the time of birth, how small a difference in the size of the fœtal head is sufficient to increase the dangers, and, necessarily, the sufferings of parturition. Dr. Simpson is of opinion that the comparative difficulty of parturition with male and female children extends to the fœtus of civilized and uncivilized races, and he refers the increased suffering of the civilized woman in childbirth to the size of the fœtal head. Some writers have expressed the opinion, that savage women do suffer as much, or nearly so, as the women of civilized races. But the general bearing of all the knowledge we possess on this subject, supports the view, that barbarian women suffer far less than women in a state of civilization. The size of the fœtal head must be considered the most important element in this matter, though at the same time there is the greater sensibility induced by the habits and social condition of the civilized and highly-cultivated female to be taken into account.

Civilization not only influences the size, but the relative size of the different parts, of the fœtal head. In uncivilized races the tendency is to increase the occipito-mental diameter, by the protuberance of the occiput, and the greater development of the lower part of the face, and to diminish the occipito-frontal diameter by the flattening of the frontal bone, and the low development of the anterior cerebral lobes. The diminution of this diameter must lessen the difficulty in the passage of the fœtal head. In the case of a Negress, whose labour I had the opportunity of witnessing, the great mass of the fœtal brain was behind the auditory foramen, the fœtal head having the shape represented in Fig. 100.

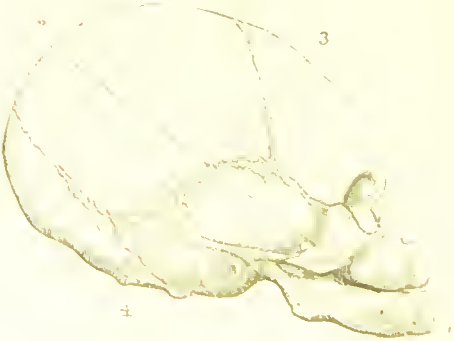
Other influences, besides civilization and education, have an influence upon the size of the head. The Caribs flattened the foreheads of their children, and the continuance of this practice through succeeding generations produced a natural flattening of the anterior part of the head, until the Carib infants were born with flat heads. The practice of flattening the head prevailed in Mexico, and, at an early date, in the eastern parts of Europe. Hippocrates gives an account of the Macrocephali, a Scythian race, believed to have inhabited the Crimea, of whom the Father of Physic says :—"There is no other race of men which have their heads in the least resembling theirs. At first, usage was the principal cause of the length of their head, but now nature co-operates with usage. They think those the most noble who have the longest heads. It is thus with regard to the usage: immediately after the child is born, and while its head is still tender, they fashion the head with their hands, and constrain it to assume a lengthened shape, by applying bandages and other suitable contrivances, whereby the spherical form of the head is destroyed, and it is made to increase in length. Thus at first usage operated, so that this constitution was the result of force; but in the course of time it was formed naturally, so that usage had nothing to do with it." Mr. Adams, the learned translator of Hippocrates, cites some researches of Dr. Rathke, as affording a remarkable corroboration of the preceding observations. Certain tumuli have been excavated in recent years at Kertch, and there were found in them several skeletons, in which the form of the head was greatly elongated, so as to resemble the shape described by Hippocrates in the Macrocephali. It is probable that one object had in view by the races accustomed to flatten the head was, that of producing a shape favourable to easy parturition.

FIG. 99.



Mature fœtal skull.

FIG. 100.



Skull of a Negro fœtus.

Binding the heads of children upon a board is practised in some parts of Europe at the present day. I have seen Polish infants arranged in this manner, apparently as a mere fashion or habit. The round head of the Greek and Turk is believed to have been in part produced by the effect of the national cap and turban, continued through successive centuries. The preceding woodcuts show the different diameters of the Negro and Caucasian skulls in the fœtus. (Figs. 99, 100).

CHAPTER XXII.

THE MECHANISM OF LABOUR.

Great improvements in any department are commonly of slow growth. This may be said emphatically of our knowledge of the Mechanism of Labour, which, with the motor forces engaged in parturition, stand at the very foundations of the science and art of Obstetrics. More than a century ago, to the honour of the Dublin school of midwifery be it said, Sir Fielding Oulde called in question the opinion which had previously prevailed universally, that the head entered and passed through the pelvis in the direction in which it emerges—namely, the antero-posterior diameter. In his little work, published in 1741, he taught that the face of the child did not lie upon the sacrum of the mother, but was always, in natural cases, turned to one side or the other. He believed, however, that the chin of the child was turned towards one of the shoulders, the neck of the fœtus being partly rotated upon its body. This error respecting the different position of the fœtal head and trunk was corrected by Smellie, and the belief in the oblique position of the head in the pelvis, gained ground amongst accoucheurs in different countries. In 1771, Saxtorph, of Copenhagen, and Solayres de Renhac, of Montpellier, published almost simultaneously the discovery that the head not only *enters* the pelvis with the long diameter in one of the oblique diameters of the pelvis, but that the long axis of the head, in the great majority of cases, occupied the *right* oblique diameter; the occiput being directed towards the left foramen ovale, and the forehead towards the right sacro-iliac symphysis. Solayres de Renhac went, however, beyond his contemporary, Saxtorph, in describing the mode in which the head passed through the outlet under various circumstances, to which we shall have hereafter to revert. These advances were realized by practical accoucheurs, especially by Baudelocque and his disciples; but it was not until 1818 that Naegelé gave a full account of the behaviour of the head in the pelvis under the various circumstances under which it may be placed in natural labour. Discarding all theory, and looking closely to the operations of Nature, he obtained an amount of knowledge which enabled him to systematize the facts of previous authors, and to give us that account of the mechanism of labour, which all subsequent observations have tended to confirm. No other work, of equally small size, ever exerted greater influence upon any branch of medicine than that of Naegelé upon midwifery. It may be termed, indeed, the Euclid of Obstetrics, but it will not have executed its mission until every accoucheur, in each individual case coming before him, entirely masters the position of the fœtal head. Nothing less than this should be aimed at by every obstetric practitioner. We must not be content with knowing that the head presents, but we must know the exact mode and direction in which the head passes through the pelvis in every labour; otherwise we scarcely attain beyond the knowledge of the midwife. "Judgment," can never be otherwise than "difficult," in such a subject. In estimating relations of position, we always naturally refer to the position of our own body as the standard of comparison. But, in a case of labour, the accoucheur stands in the upright position, and has to deal with the mother and the child in the horizontal position; the fœtus and the mother being themselves reversed, the child standing, as it were, on its head within the system of the mother. These complicated positions are so difficult to master, that I have heard men who have attended hundreds of cases confess themselves as just beginning to be certain of the presentations in particular instances. It is only a careful study of the pelvis and the fœtal head in the dried state, and a painstaking observation of the relations of the head and the pelvis in every case of labour, that will enable the student to master this difficult problem. Naegelé tells us that he kept his finger on the head during the whole course of a labour, when he wished to ascertain any particular point. There is still enough to be made out respecting the function of parturition to reward every diligent practitioner who may devote his energies to the prosecution of this subject. In every particular, we must analyse and synthesize the movements of the fœtal head, and also the motor forces and mechanisms, which urge and direct it in its course through the pelvis and parturient canal.

The largest movement of the fœtal head in parturition, is that through the canal of the pelvis and the passage formed by the vagina and soft parts. This movement is common to all the positions in which the head passes through the pelvis. In its performance, the centre of the head corresponds pretty nearly with the axes of the hard and soft portions of the parturient canal. To this common movement are superadded various movements of the head upon its bilateral axis, its antero-posterior axis, and its vertical axis, all of which vary in character and extent according to the position in which the head first engages in the pelvis. These movements and differences considered in relation with the pelvis, constitute the Mechanism of Labour, and the several "Positions" as they are called, in which the head presents and passes through the pelvis and soft parts. The head lies at very various depths at the commencement of labour. Sometimes the developed cervical portion of the uterus, and the contained fœtal head, lie entirely in the pelvis, before the commencement of any uterine action. At others the head is high up in the pelvis, and has scarcely, if at all, entered the brim. As Dr. Rigby points out, the head is more frequently low in the pelvis in primipara, and high up in multiparous women. The cause of this is probably the greater rigidity of the abdominal walls in primiparæ as compared with multiparæ. In many multiparous cases, the head is, however, wholly within the pelvis for some time before the commencement of labour. For the description of labour, it is however convenient to take those cases in which the head is high up as the standard; as this gives us an opportunity of tracing the steps by which the head descends through the pelvic canal.

The mechanism of labour is necessarily somewhat complicated, and it should be the aim of all teachers to render it as simple as possible, by describing as few varieties as are consistent with nature, and requisite to be understood in practice. It is easy to multiply varieties in the position of the head, by insisting upon trivial differences; but disservice rather than service is done in this way to the advance of obstetric knowledge. It is to be hoped that each successive describer of the process, having the aid of those who have gone over the same subject before him, may do something towards rendering the obstetric mechanisms more and more intelligible, and more decidedly linked with practice.

There are four principal Positions in which the fœtal head presents in the pelvis, and these positions we shall now proceed to consider. The two first positions are termed Occipito-Anterior, because in those the occiput is placed towards the Pubis. The other two are called Occipito-Posterior, because in these the occiput is turned towards the Sacrum.

The movements of the fœtal head during its passage through the pelvis are described under the following terms:—

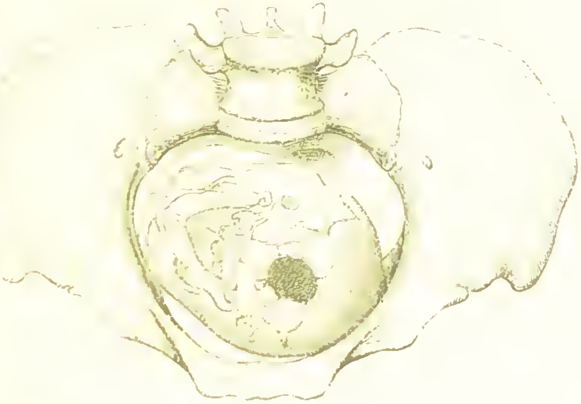
OBLIQUITY,
FLEXION,
ROTATION,
EXTENSION, and
RESTITUTION.

Each of these processes requires careful study in order to understand the various processes summed up as the mechanism of labour.

In the First Position, the head, as already mentioned, enters the pelvis in the right oblique diameter, or in a line between the transverse and oblique diameters. The occiput is placed towards the left acetabulum, and the forehead towards the right sacro-iliac synchondrosis. At first, the long diameter of the head is parallel, or nearly so, with the superior plane of the pelvis, the occiput and sinciput being about on the same level. But the right side of the cranium is considerably lower than the left, so that the most depending part of the cranial surface is the protuberance of the right parietal bone. This lateral depression is called the Obliquity of the Head. As the head descends, there is a slight movement upon the bilateral axis, and the occiput generally becomes lower in the pelvis than the forehead. This descent of the occiput is called the Flexion of the Head. The following engraving shows the entrance of the fœtal head into the pelvis in the right oblique diameter after it has commenced its descent. The mastoid process of the left temporal bone and the chin are at this time the highest portions of the fœtal head; the right half of the occipital bone, and the adjoining portion of the temporal bone, being depressed.

If we examine per vaginam when the head is in the upper part of the pelvis in this position, the right tuber parietale is felt through the walls of the anterior portion of the cervix

FIG. 101.



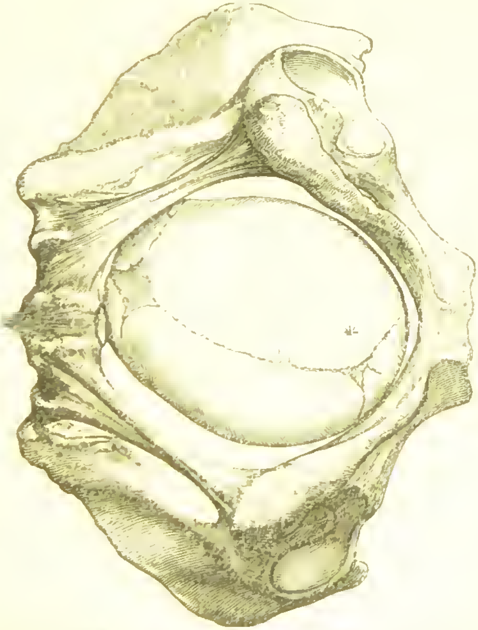
Brim of the pelvis and base of the fœtal cranium in the first position.

uteri. This is the point with which the finger comes in contact at the most depending part of the head. The right ear of the child can be felt behind the pubes, if the os uteri is sufficiently open to allow of its being reached. At this time the os uteri does not occupy the axis of the pelvic canal, but is more posterior, and directed towards the upper part of the sacrum. If the finger is passed into the os uteri, the sagittal suture is felt crossing the field of the os, in an oblique direction. The patient lying on the left side, the accoucheur standing or sitting behind, and bending over her to make the examination, feels the sagittal suture running forwards and downwards in one direction, and upwards and backwards in the other. The sagittal suture divides the os uteri unequally, a larger portion of the middle and upper part of the right than the left parietal bone being included within the ring of the os. It is this middle and upper portion of the right parietal bone which is felt in making an examination at this period, and it is here that the tumour of the scalp is formed, when it is caused by the pressure of the head against the partially dilated os uteri. If the os uteri is sufficiently dilated to allow the finger to be passed along the sagittal suture, it reaches in front, and to the left side of the mother, the triangular posterior fontanelle, and the diverging lambdoidal suture, while behind and to the right side of the mother it comes in contact with the lozenge-shaped anterior fontanelle, and the coronal and frontal sutures. The earlier the examination is made, the more decidedly oblique, or approaching the transverse direction, will the sagittal suture be found.

As the fœtal head descends in the pelvis, it performs the movement which is termed, *par excellence*, the Rotation of the Head. The long diameter of the head changes from the oblique to the antero-posterior diameter, or nearly so. The most prominent portion of the occipital bone glides downwards and forwards upon the inclined planes formed by the descending ramus of the pubis and the internal surface of the ilium, so that the middle portion of the superior and posterior quarter of the right parietal bone, and its posterior and upper angle, become successively the most prominent points of the descending head. In this latter position the tumour of the scalp or caput succedaneum is formed, by the pressure of the soft parts of the outlet upon the head. In this position, also, the head emerges underneath the arch of the pubis. In the rotatory movement from the oblique to the antero-posterior diameter, the head describes about one-eighth of a circle. In emerging from the pelvis, the obliquity of the head is almost as great as at its entrance, the right tuber parietale being still lower than the left. The head does not emerge either with the occipital or parietal protuberance foremost, the part which escapes first being a point between the two, namely (as already mentioned), the upper and posterior part of the right parietal bone. The following engraving represents the fœtal head low down in the pelvis, in the first position. The pelvis is placed on its left side, so as to imitate, as far as possible, a resemblance of what is felt by the finger of the accoucheur, in making an examination at this part of the process, as far as the bones are concerned. I believe this is the first time such a representation has been made, and it appears to me to convey more information than any figure of the base of the fœtal skull and brim of the pelvis—the method hitherto followed in illustrating the mechanism of labour. (Fig. 102.)

Another movement of the fœtal head now demands our attention. We have referred to the flexion of the head, by which the chin is brought towards the sternum, and the occiput depressed. When the occiput has passed under the arch of the pubis, this portion of the head becomes to a great extent a fixed point, and the frontal bone and face of the

FIG. 102.

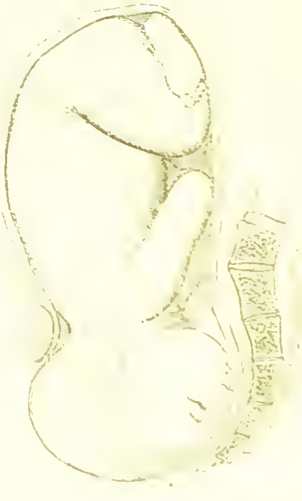


Outlet of the pelvis, with the fœtal head passing through in the first position. The asterisk marks the presenting portion.

child come down, describing an arc in their progress. This is called the Extension of the Head, the chin being now separated from the sternum, and the forehead appearing as the lowest part of the cranium.

Immediately after its emergence from beneath the pubic arch, the head usually rotates back again to the aspect it held in the upper part of the pelvis, the face becoming turned towards the right thigh of the mother. This re-rotation, which is termed the Restitution of the Head, is effected in the following manner:—It generally happens, that as the head escapes, the right shoulder of the fœtus is lowest in the pelvis, and impinges upon the anterior surface of the right ischial spine. From this point it rotates forwards towards the arch of the pubis, under which it passes out, the left shoulder resting upon the perinæum, and generally escaping first. Thus the body of the fœtus rotates in an exactly opposite direction to the previous rotation of the head. The left side of the head glides down the left ischial plane, and the right shoulder glides down the plane of the right ischium. If it should happen, which is occasionally the case, that the left shoulder should be lowest in the pelvis, it glides down the left ischial plane, the shoulders rotate in the same direction as the head, and the face of the child is then turned downwards and towards the left thigh of the mother. When the pelvis is large, and the delivery effected suddenly, the shoulders are sometimes expelled in the transverse diameter of the pelvic outlet without any rotation. In the emergence of the head and trunk from beneath the pubis, the direction impressed by the perinæum and the expulsive efforts is such that the head turns upwards between the thighs of the mother, in front of the symphysis pubis, as represented in the following engraving :—

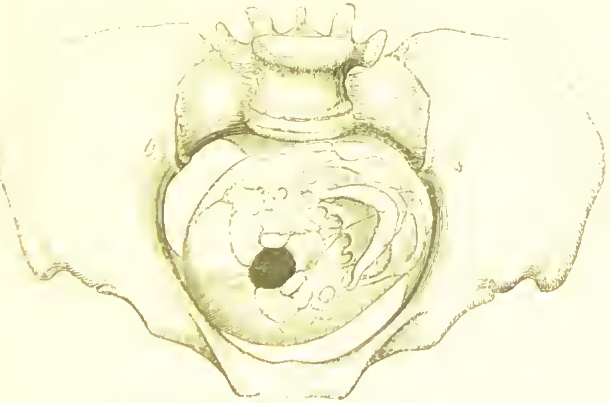
FIG. 103.



Extension and emergence of the head.

In the Second Position, the occiput is turned towards the right acetabulum, and the forehead towards the left sacro-iliac synchondrosis, as the head passes through the brim. The left part of the base of the skull is lowest, the occipital dip, or flexion, being the same as in the first position. (Fig. 104.)

FIG. 104.



Brim of the pelvis, and base of the fœtal cranium in the second position.

The left side of the head is the lowest in the second position, as the head descends, the same portions of the left parietal bone being prominent, instead of the right. The left ear is felt behind the pubis. The sagittal suture is now found nearly parallel to the left oblique diameter. In an examination, the finger passes upwards and forwards to reach the posterior fontanelle, and downwards and backwards to reach the anterior. The occiput glides down the right ischial planes. The rotation is precisely the same as in the first position, except that it is in the reverse direction. The rotatory movements of the shoulders are also reversed, the face of the child generally turning downwards, and to the left thigh of the mother. The following figure represents the head passing through the pelvis in the second position. (Fig. 105.)

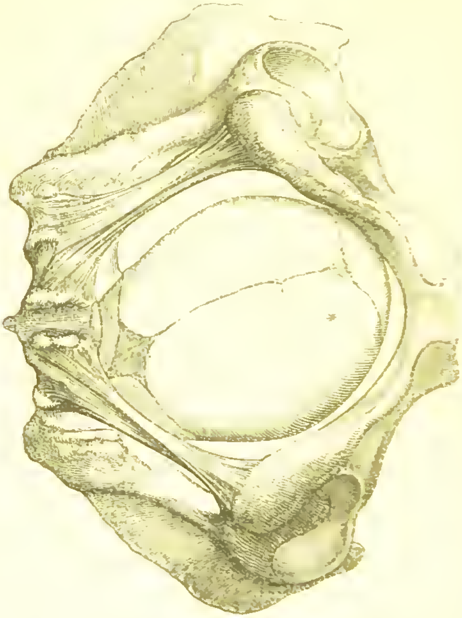
Let us now proceed to recapitulate the different evolutions performed by the fœtal head in its passage from the pelvic brim to the external world in the first and second positions.

I.—The movement in the Parabolic Curve formed by the axes of the pelvic canal and of the vagina.

The different parts of the fœtal head change their position in this progress, but the centre of the fœtal head may be considered as traversing the axes of the pelvis and of the soft parts of the parturient canal.

II.—The movement of the fœtal head upon its Occipito-Frontal Axis.

FIG. 105.



Outlet of the pelvis, and the fœtal head passing through it in the second position. The asterisk marks the presenting portion.

This movement causes one side of the fœtal head to become lower than the other during the whole progress of labour, after the head has entered the brim, constituting the Obliquity of the Head.

III.—The movements of the fœtal head upon its Bi-parietal Axis.

These movements consist—first, of the depression of the occiput; and second, of the depression of the sinciput. In the descent of the head through the pelvis, the occipital pole is depressed, constituting the Flexion of the Head; but as it emerges under the pubic arch, the frontal pole becomes the lowest point. This oscillation of the forehead downwards upon the bi-lateral axis, constitutes what is termed the Extension of the Head.

IV.—The rotatory movements of the fœtal head upon its Perpendicular Axis.

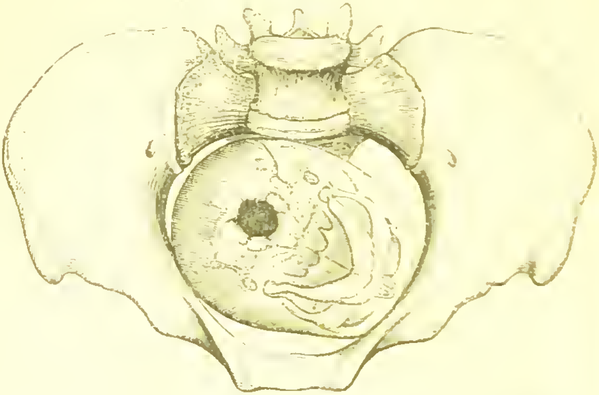
These movements constitute the rotations of the head in the pelvis, and subsequent to the delivery of the head. The former has been described as the Rotation, and the latter as the Restitution of the fœtal head. If the head should be placed transversely at the brim of the pelvis, since it emerges in the antero-posterior diameter, or nearly so, it makes about one-fourth of a complete rotation; but if it be placed in the oblique diameter at the commencement of labour, the rotation is little more than one-eighth of a circle.

We may here consider briefly the intent and object of the various movements known as Obliquity, Flexion, Rotation, Extension, and Restitution. By the Obliquity of the head, the smallest diameter of the head is always presented to the canal of the pelvis, that is to say, the bi-parietal diameter is never opposed to the pelvic diameters, in consequence of one bi-parietal protuberance always being lower in the pelvis than the other. The Flexion and Extension of the head moves it through the parabolic curve of the pelvis. By these movements of the head its entrance in the axis of the inlet is facilitated, and its exit through the axis of the outlet of the pelvis also. The acts of Rotation and Restitution have reference to the passage of the head and shoulders of the child through the pelvis, considered as the chamber of a screw. It is these movements which keep the long diameter of the fœtal head and thorax in the long diameters of the different planes of the pelvis.

In the Third Position, the forehead is, at the commencement of the passage through the pelvis, placed opposite the left acetabulum, and the vertex towards the right sacro-iliac synchondrosis. The fœtal head occupies the right oblique diameter, as in the first position, only the long diameter of the head is exactly reversed, the sinciput being directed forwards, and the occiput backwards.

The anterior and posterior fontanelles are at this time generally on a level, or nearly so. The sagittal suture, as the patient lies in the obstetric position, runs obliquely forwards and downwards, and upwards and backwards, just as in the first position. Passed downwards and forwards, the finger comes to the anterior fontanelle, and upwards and backwards it reaches the posterior bregma. Instead of the right tuber parietale, it is the left parietal bone which is felt lowest in the pelvis. Generally in these cases, as labour proceeds, the vertex descends more than the forehead, so that it is easier to

FIG. 106.

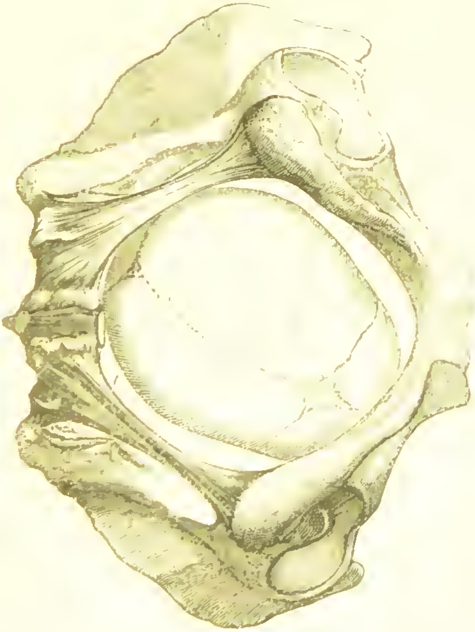


Brim of the pelvis, and base of the cranium in the third position.

reach the posterior than the anterior fontanelle. When the head is thus placed in the third position, it may take two paths in its exit from the pelvis. In one, the vertex may continue to descend, and approach towards the antero-posterior diameter of the outlet, the head being expelled with the forehead towards the pubis, and the occiput towards the sacrum. The head in this case is expelled just as it is in the oblique position, except that the positions of the forehead and vertex, and the anterior and posterior fontanelles, are reversed. If the head takes the second route, the vertex, instead of descending in its original position, or inclining towards the sacrum, rotates upon its perpendicular axis, and the long diameter of the head passes first into the transverse diameter of the pelvis, and then into the left oblique diameter. At the completion of this change, the head exactly occupies the second position, with the posterior fontanelle towards the right foramen ovale, and the anterior fontanelle towards the left sacro-iliac synchondrosis. The modes in which these two different terminations of the third position are effected are as follows.

The spinous process of the ischium appears to be the determining cause of the ultimate direction of the head in the third position. If the occiput is driven below and behind this point, the head emerges from the pelvis in the position it held at the commencement of its passage through the pelvis, or nearly so. The forehead is in apposition with the left part of the pubic arch, and the occiput with the right sacro-iliac synchondrosis. The prominence of the occiput is in this case a serious impediment to the passage of the head over the sacral surface and through the perinæum. When the pelvis and the head are of average size, the fœtal head cannot pass in this position until it has been moulded by the pressure of the sacrum and the uterine pains. Before the head is expelled, the occiput is compressed and the cerebral mass is thrown forwards, so that when the child is born, the forehead is prominent and the occiput depressed. Some authors say that the fœtal head seldom or never passes in this direction, except when

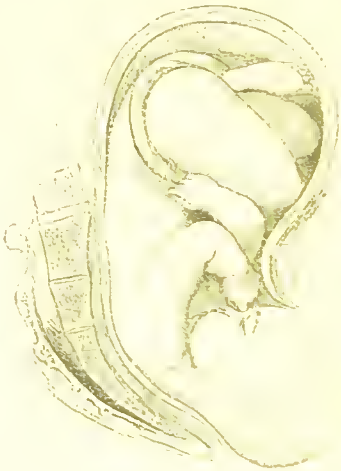
FIG. 107.



Outlet of the pelvis, and the fœtal head in the third position. The asterisk marks the presenting portion.

the pelvis is small and the fœtal head large; but I have several times met with examples of the third position in which the head had descended to the perinæum in the third position, in cases where the head had been of large size, and in which it was necessary to apply the forceps to effect delivery. When the child is born in the occipito-posterior position, the forehead, eyes, nose, mouth, and chin successively emerge from under the pubis, and the occiput is forced down the sacral and coccygeal planes, and over the perinæum. This is represented in the following figure, which may be contrasted with Fig. 103.

FIG. 108.

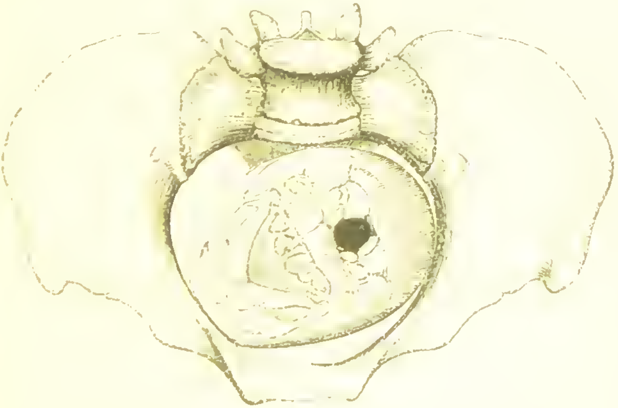


Expulsion of the head in the occipito-posterior position.

More frequently, the head, on entering in the third position, passes downwards, until the occiput meets the spine of the right ischium, when, instead of passing behind this prominence, it glides in front of it, and, directed by the ischiatic planes, passes downwards and forwards until it occupies the second position. The vertex in this movement travels from the right sacro-iliac symphysis to the right foramen ovale. The head is then borne in precisely the same way as though it had originally presented in the second position, or the left oblique diameter of the pelvis.

In the Fourth Position, the head enters the pelvis in the left oblique diameter, but the forehead is directed towards the right acetabulum, and the occiput towards the left sacro-iliac synchondrosis. Just as the third position is the reverse of the first, so this is the reverse of the second. As the head enters the brim, the occiput and the right side of the base of the fœtal head are depressed, and the right parietal bone is the lowest point. This is represented in the following figure.

FIG. 109.

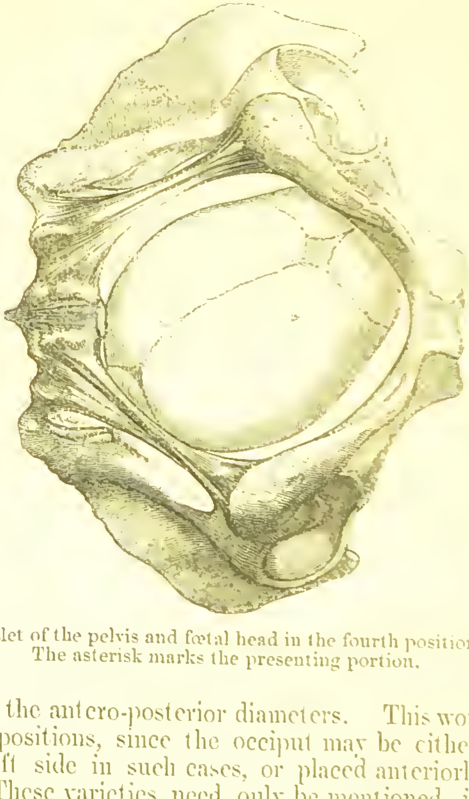


Brim of the pelvis, and base of the fœtal cranium in the fourth position.

Inferiorly, the sagittal suture runs in the same direction as in the second position; but the anterior fontanelle is divided towards the right foramen ovale, and the posterior towards the left sacro-iliac synchondrosis. The right parietal bone is the presenting portion of the head, and the part reached in examination by the finger is the anterior and upper part of the right parietal surface. As in the third position, the vertex may either pass into the hollow of the sacrum, and the head be delivered in the left occipito-posterior position, or it may advance in front of the spine of the left ischium, and be converted into the first position. The latter is the usual termination of presentations in the fourth position, just as delivery in the second position is the usual sequence of presentations in the third position.

These are the chief positions in which the head presents and passes through the pelvis in natural cases. Other varieties are enumerated by some obstetric teachers, such as the descent of the head through the upper part of the pelvis, in the trans-

FIG. 110.



Outlet of the pelvis and fœtal head in the fourth position. The asterisk marks the presenting portion.

verse or in the antero-posterior diameters. This would make four other positions, since the occiput may be either on the right or left side in such cases, or placed anteriorly or posteriorly. These varieties need only be mentioned, in regard to the mechanism of natural labour, as they rarely, if ever, occur, except when the head of the fœtus is very small in comparison with the size of the pelvis, or when the pelvis is deformed, and its transverse or antero-posterior diameters considerably increased.

Mechanism, Position, and Motor power, in their various relations, are the Elements, or Grammar, the Euclid of the Obstetric Art. It is absolutely necessary that they should be mastered in order to practise midwifery with anything like satisfaction. I need not dwell on the difference between the state of mind of a student or young practitioner who, with a case of labour under his hands, knows the exact position of the head, and one who merely knows that the head presents, without being in the least degree aware of the position in which it may be expected to make its exit. The one will await the result with the confidence which knowledge alone imparts; the other will be disturbed with fears of something wrong, and anticipations of occipito-posterior births, when nothing of the kind is likely or possible, or with apprehensions of other complications or causes of difficulty and delay.

The positions in which the head presents are not most frequent in the order in which they are numbered in describing the positions themselves. The presentations in the First Position are more numerous than all the other positions put together. Naegelé found the first position to occur in 69 per cent. of the head presentations which came under his observation. M. Halmagrand gives 74 per cent., Madame Lachapelle 77 per cent., and Madame Boivin 80 per cent., as the proportion of the first position in head cases. Dr. Martin Barry found the first position in 256 cases out of 335 cranial cases. The variation between 69 and 80 per cent. is not very great, and as the statistics of these authors extend to 60,000 cases, we may be sure that the frequency of the presentation of the head is pretty accurately given in these results. Since the time of Naegelé's observations, the Third Position has been shown to be the next in frequency to the first. In Naegelé's own practice, he diagnosed the third position in 29 per cent. out of 1210 cases. Other authors describe the Second Position as being met with in a greater proportion than that given by Naegelé, and they place the second position as being the next in frequency to the first. Naegelé explains this by supposing that the occurrence of the third position is frequently not ascertained until it has changed into the second position, and it has then been considered to have been the second position originally. This is in all probability the truth. Madame Boivin describes the second position as occurring in 19 per cent., and Madame Lachapelle in 21 per cent.; while Naegelé, out of more than 1200 cases, found it only in ·07 per cent. Dr. Simpson remarks that Naegelé's observations were made by himself, while those of Madame Boivin and Madame Lachapelle were made by females attached to the Maternité Hospital of Paris. We may, then, conclude that Naegelé's proportions are the most correct, and observations made subsequently to his own tend strongly to confirm them. Naegelé found the Fourth Position to occur only in the small proportion of ·03 per cent. Thus we may consider the first position as the most frequent; the third comes next in order; and the second and fourth are the most rare. In this enumeration, cases occurring originally in the third and changing into the second, are considered as belonging to the third position. While I have no doubt that Naegelé was, in the main, correct in his estimate of the great frequency with which the third position changes into the second, I believe a larger number than he supposes are delivered as occipito-posterior cases. Naegelé states, that out of 96 cases in which the head presented originally in the third position, he only observed it to be delivered in the occipito-posterior direction in three cases, and in all of these the pelvis was larger than usual, or the head was small and compressible. Out of a much smaller number of vertex cases in the third position, I have met with three instances in which the labours were very severe, and in which the head passed with the occiput towards the rectum.

In the first and third, or the most common positions of the head at the commencement of labour, it will be observed that the head occupies the right oblique diameter: in the first the occiput being the most anterior part of the head, and in the third the sinciput. In the first, the right side of the head is lowest in the pelvis. In the third, the left side of the head is the most depending part. As far as I am aware, no other reason can be given for the greater frequency of presentations in the right oblique position, than the occupation of the posterior part of the left oblique diameter by the rectum.

It is necessary that what is meant by the presenting part of the fœtal head should be clearly defined. Hitherto, a good deal of confusion has prevailed upon this subject. Is it the part found most prominent within the ring formed by the soft parts of the parturient canal in the different stages of labour—namely, the os uteri, the vagina, and the ostium vaginæ? Is it the part of the head found lowest in the pelvis during the progress of labour? Or is it the part first met with on introducing the finger into the pelvis, in the direction of its axes? It will be found that all these points of view are mixed up together, in some of the best and most recent works on obstetrics, with the effect of causing considerable uncertainty. For instance, the right tuber parietale is very commonly said to be the presenting part in the first and fourth positions, as the head passes through the brim and upper part of the pelvis, because it is the lowest point met with on introducing the finger into the vagina. It is, however, more frequently—indeed, almost invariably—felt through the anterior wall of the cervix, and not within the ring of the os uteri, unless after the full dilatation of the latter. I would suggest that it would be best to define the presenting part, in every kind of cranial position or presentation, as that portion of the fœtal head felt most prominently within the circle of the os uteri, the vagina, and the ostium vaginæ, in the successive stages of labour.

We may consider the right and left tuberosities of the parietal bones as points common to the positions in which the occiput is found either on the right or the left side of the pelvis respectively. That is, in the first and fourth positions, the occiput is in one case in the early part of labour in the neighbourhood of the left acetabulum, and in the other near the left sacro-iliac synchondrosis. In both the right tuber parietale is the lowest point of the fœtal head, in the early part of labour. In the second and third positions, the occiput is turned towards either the right acetabulum or the right sacro-iliac synchondrosis. In both, the left tuber parietale is lowest in the pelvis.

In the first position, when the os uteri is open to the extent of, say an inch in diameter, the part felt within the circle of the os is the upper and nearly the middle portion of the right parietal bone. As labour advances, the part of the head in the centre of the dilated os uteri is the middle portion of the posterior and upper quarter of the same bone. When the os is sufficiently open, the right tuber and the right ear may be felt. As the head advances through the vagina and presents at the outlet, it is the upper and posterior angle of the bone which is most prominent. It is upon these parts in succession that the tumour of the scalp or caput succedaneum is formed by the pressure of the os uteri and the other portions of the parturient canal upon the fœtal head. The tumour of the scalp formed upon the middle of the upper half of the right parietal bone by the os uteri, may be called the primary caput succedaneum. When the os uteri is rigid, this swelling marks the fœtal head very distinctly, and if the subsequent part of the labour should be easy and rapid, there may be no other tumour. If the latter part of labour should be difficult, a swelling of the scalp is formed over the posterior and superior angle of the right parietal bone. This may be called the secondary tumour. Sometimes the dilatation of the os uteri is so easy, and the compression of the scalp so slight, that no primary tumour is formed. In other cases a tumid ridge extends from the middle of the upper border of the right parietal bone to its posterior and superior angle, or even to the upper portion of the occipital bone.

In the fourth position, the part first felt within the os uteri, as the head lies in the left oblique diameter, with the occiput towards the left sacro-iliac synchondrosis, is the middle of the upper portion of the right parietal bone, very nearly, in fact, the same point as is felt in the first position. It is here that the primary tumour of the scalp is formed. The sagittal suture is, however, nearly in the direction of the left oblique diameter, the anterior fontanelle is directed towards the right acetabulum, and the posterior fontanelle towards the left sacro-iliac synchondrosis. In the first position, the sagittal suture, it will be borne in mind, runs nearly in the direction of the right oblique diameter.

It has been shown that the head, when presenting in the fourth position, may descend through, and emerge from, the pelvis in two modes. The occiput may turn towards the hollow of the sacrum, in which case the frontal bone approaches the left side of the pubic arch; or, as we have seen, the occiput may turn forwards and make a quarter, or rather more than a quarter turn, so as to approach the left portion of the pubic arch.

In the first termination, the anterior and upper portion of the right parietal bone passes first through the vagina, and emerges underneath the arch of the pubis. It is upon this point that the secondary caput succedaneum is formed. Sometimes this overlaps the posterior part of the right frontal bone, and some portion of the anterior fontanelle.

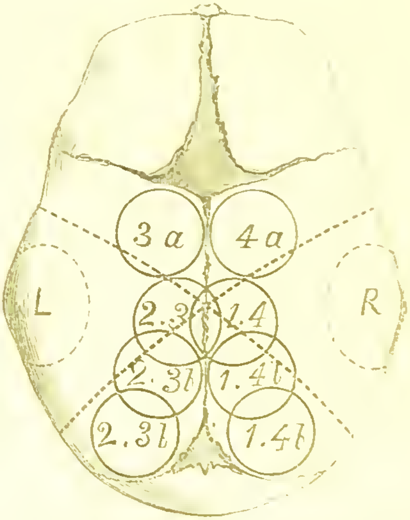
In the second termination of the fourth position, the parts of the head present in almost precisely the same order as in the first position, and the tumour of the scalp is formed in the same sites. The change is from the middle and upper portion of the right parietal bone to the posterior and upper angle of the same bone.

In the second and third positions, the presenting parts of the fœtal head and the tumours of the scalp are the same as in the first and fourth, only it is the several parts on the left parietal bone, instead of the right. In the second position, the middle of the upper portion of the left parietal bone presents in the first instance, and the movements of rotation and advance gradually bring the posterior and upper portion of the parietal bone to be the site of presentation under the left portion of the upper part of the pubic arch. In the third position, it is the middle and upper portion of the left parietal bone which presents within the area of the dilating os uteri. In the first and common termination of this position, the head, in making its quarter turn, so as to bring the occiput to the right foramen ovale, brings the same parts of the left parietal bone into presentation, as in the second position. In the second termination of the third position, the turn to the extent of one-eighth of the circumference of the pelvis brings the anterior and upper part of the left parietal bone to be the presenting part, and this is the first portion of the head to emerge under the pubis in such cases.

As the vertex is not the first part to be delivered in occipito-anterior cases, but the posterior and upper part of the right and left parietal bone, it follows that in labours occurring in the first position and in the occipito-anterior termination of the fourth position, it is the right tuber parietale which is first delivered. When this has passed through the ostium vaginæ, the circle of the outlet intersects the head between the two tuberosities in a diagonal direction. The same occurs with respect to the left tuber parietale in the second position, and in the occipito-anterior termination of the third position. So, also, in occipito-posterior deliveries, the two tuberosities do not pass through at the same time. In the fourth position it is the right, and in the third the left, tuber which first escapes. Thus the bi-parietal diameter of the head always passes through the pelvis and soft parts in an oblique direction, so that the largest lateral diameter never engages the opposite sides of the canal at the same time. (Fig. 111.)

The moulding of the fœtal head during a severe labour is peculiar in the different positions. In the occipito-posterior positions, the mass of the brain and the cranium are so moulded that the anterior or frontal end of the cranial ovoid becomes larger than the occipital. In the fourth occipito-anterior position, the right, and in the third, the left, side of the frontal region is the most prominent. In the first, and the occipito-anterior terminations of the fourth position, the head is moulded so as to make the right side of the head, and especially the right side of the occipital and posterior parietal regions the most prominent. In the second, and the occipito-anterior terminations of the third, the same prominence is impressed upon the left and posterior portion of the fœtal head. Dr. Swayne, of Bristol, has pointed out that in occipito-posterior positions, a vacant space may be felt under the pubic arch, owing to the small size of the frontal part of the head before it has been moulded by the pressure of parturition.

FIG. 111.



R. Right parietal bone. *L*. Left parietal bone.

1, 1, 1. The different points of the right parietal bone which present successively in the first position.

4. The part of the parietal bone which presents at the os uteri, in the fourth position, at the commencement of labour.

4*a*. The part of the parietal bone which presents at the ostium vaginæ, in the fourth position, when the head is delivered in the occipito-posterior position.

1*b*, 4*b*. The points of the right parietal bone which present successively when the head, presenting in the fourth position, makes the quarter turn, and is delivered in the occipito-anterior position.

The figures 2, 3, 3*a*, and 3*b*, 3*b*, mark, in the same way, the presenting points in the second and third positions of the head, on the left parietal bone.

The two diagonal lines across the head mark the intersection of the head by the vulva and perinæum, as the head passes out, so that only one tuber parietale occupies the ostium vaginæ at the same time.

On former occasions I have referred to the principle of the

Screw, which obtains in the pelvis, and to the Screw-like, Spiral, or Rotatory movement of the fœtal head in passing through the pelvis in the different cranial positions. It has not hitherto been made out, but I believe the mechanism of the pelvis and the fœtal head to be precisely that of a body moving down a spiral inclined plane, or screw. A screw is an inclined plane, arranged in a spiral form, either round a solid cylinder, or upon the internal surface of a hollow cylinder. When the one is fitted into the other, the spiral arranged round the solid cylinder is called the male, and that around the hollow cylinder, the female screw. In the mechanics of parturition, the pelvis plays the part of the female, and the fœtal head the part of the male screw; and it is by the movement of the one within the other, in a spiral direction, that the head passes, so as to meet with the least possible mechanical resistance from the pelvis and soft parts.

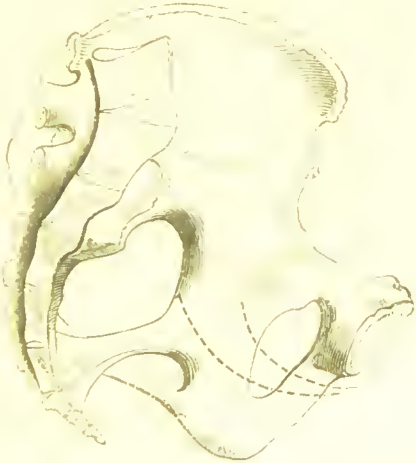
The transverse, oblique, and antero-posterior diameters are successively the longest diameters, in passing from the brim of the pelvis to the outlet. The fœtal head, being of oblong shape, can only pass by entering the brim in a position approaching to the transverse, and descending with the long diameter of the head in relation, first with the oblique diameter, and then with the antero-posterior diameter of the pelvis, or very nearly so. Such is, in reality, the direction in which the head moves. A number of pelves may be placed one above another, so as to represent pretty correctly the chamber of a female screw; and a line drawn through the long diameters of the various planes would form a spiral, and mark the path of the groove, or thread, as it is termed, of the screw. In the single pelvis, a line drawn from the transverse, through the oblique, and towards the antero-posterior diameters, would mark the path of the portion of the spiral through which the fœtal head moves in parturition. This, in the case of the first position, is somewhat more than one-eighth of a circle. The arrangement of the fœtal head with reference to the trunk favours this rotation. The spiral incline of the pelvis impresses itself upon the fœtal cranium, as the thread of the male screw, and this rotation is facilitated by the ease with which the head of the fœtus moves upon the neck.

The pelvis represents a portion of a female screw, admitting a male screw (the fœtal head), of an oblong shape. But the male and female screws, in the case of the pelvis and fœtal head, are not accurately adjusted at all points. There is, however, a general adjustment in the shape of the fœtal head and the arrangement of the pelvic diameters. It is only at the points where the posterior part of the parietal bone, or of the occiput, comes in contact with the planes of the ischium and pubis, that the thread of the male screw bites, as it were, the thread of the female. It is here that the spiral direction is impressed upon the fœtal cranium. The line of this portion of the spiral or screw may be made out by chalking the salient point of the fœtal head, and moving it through the pelvis in the direction it takes in parturition. The chalk line marked upon the pelvis by this proceeding will show, accurately, the track of the segment of the thread or groove of the female screw, through which the prominent portion of the head passes.

The two halves of the pelvis also represent portions of two screws, the inclined planes of which are arranged in opposite directions. Thus, if the head be placed in the second position, the spiral movement is reversed from that which obtains in the first position, and the long diameter of the fœtal cranium moves from the transverse, or the left oblique, to the antero-posterior diameter. In the case of labour occurring in the first, the right shoulder moves upon the right portion of the spiral or screw formed by the right ischium and pubis, and glides down it, just as the head does in the second position. In the second position, on the contrary, after the delivery of the head, the left shoulder rotates upon the planes of the screw or spiral of the left side of the pelvis, and passes out with a movement similar to that which belongs to the head in the first position.

Perhaps the screw or spiral motion is seen still more distinctly in the common terminations of the third and fourth positions. Here, rather more than one-fourth of a circle is completed in the movement which brings the occiput from the right or left sacro-iliac synchondrosis, to the right or left ramus of the pubic arch. The movement is distinctly spiral, only that when the head presents in the occipito-posterior position, it has to pass through a spiral having a larger diameter than when the head presents in the occipito-anterior positions. The two lines marked upon the following diagram mark the different paths through which the head glides when it presents in the first and fourth position, and passes towards the antero-posterior diameters. In both it is distinctly screw-like, or spiral. A similar diagram of the right side of the pelvis would give the lines of the spirals traversed by the head in the second and in the third positions, when the head is born in the occipito-anterior position.

FIG. 112.



Outline of the internal surface of the left half of the pelvis. The two curved lines mark the path of the head in the first, and in the occipito-anterior termination of the fourth positions.

The contractions of the uterus and abdominal muscles constitute the *vis à tergo* which moves the fœtal head down the planes of the ischium and pubis. No rotatory movement appears to be given to the fœtal head by the pains. The spiral direction depends entirely upon the portion of the spiral inclined plane formed by the osseous surfaces. If any weight or pressure be placed upon a male screw, adjusted in the chamber or box of the female, it has the tendency to descend the spiral plane. We see this familiarly exemplified in the press for stamping letters, in which a weight at the top of the screw causes it to descend. In practice, these considerations are important with reference to the direction in which traction can be used to the greatest advantage in delivery by the long or short forceps; in rectifying the position of the head in the case of presentations in the third and fourth positions; and in other operative proceedings.

CHAPTER XXIII.

THE STAGES OF LABOUR.

I HAVE been accustomed in teaching to depart from the usual arrangement, and to divide Labour into a Preliminary and a Supplemental Stage, and into three principal stages of Dilatation, Propulsion, and Expulsion.

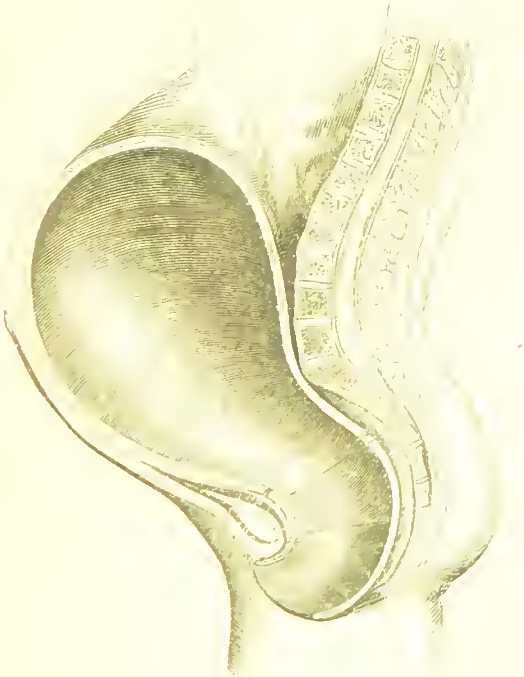
In the Preliminary or Preparatory Stage, the uterus and other organs become fitted for the commencement of actual labour.

For two or three weeks before the date of parturition there is usually some subsidence of the abdominal tumour; the womb sinks into the pelvis; the waist, in consequence, becomes smaller, and the respiration and general mobility are less oppressed. A day or two before the accession of labour, the descent of the uterus is still more remarkable, and it now begins to contract in an equable and continuous manner, as though gathering itself up for the coming effort. This contraction of the uterus is moderate, and it is not always paroxysmal, or attended by uterine pain. In the preliminary stage of labour there is the persistent contraction of the whole of the uterus, which has just been referred to; the uterus becomes firm and ovoid, and is more readily distinguishable from the rest of the abdominal contents than before. The abdominal tumour now becomes distinctly uterine. Owing to the persistent contraction of the uterus, the mother sometimes misses the rolling movements of the uterus, and imagines the child to be dead. Besides the persistent uterine contraction, there is usually an irritable state of the sphincters of the rectum and bladder. The bowels are generally opened two or three times, and there is a frequent desire to evacuate the bladder. The effect of these actions of the bladder and the intestines is to free the pelvis and the lower part of the abdomen from all unnecessary incumbrance, and thus to afford room to the parturient canal. As the pains commence, there is usually a sanguineous discharge, termed the "show," but this is not invariably present.

In the Stage of Dilatation, the os uteri is opened, so as to admit the passage of the fœtal head.

In this process of expansion, the os and cervix uteri are to a certain extent obliterated, and the uterus and vagina become

Fig. 113.



The cavity of the uterus, with the parturient canal in a state of full dilatation.

one continuous canal. (Fig. 113.) In a preceding chapter (page 283) I have dwelt on the mode in which this dilatation is effected, partly by the influence of the contraction of the body and fundus upon the os uteri, partly by the fluid pressure of the amniotic bag, and partly by the active dilatation and relaxation of the circular fibres or imperfect sphincter of the os itself.

The direction in which the motor force of the uterus is at first exerted is downwards and backwards, in the direction of the axis of the uterus, and the axis of the inlet of the pelvis. The dilatation of the os uteri tends, by reflex action, to dilate the cardia, and this often goes on to such an extent as to produce actual vomiting. When the stomach is emptied of its contents, the freedom of the respiratory movements is increased, and the dilatation of the parturient canal is promoted. Sickness is sometimes present during the whole of this stage, but, if not, it frequently appears at the time of the complete dilatation of the os uteri.

It is not a little remarkable, that in the early part of the stage of dilatation, the excitor nerves affected by the pressure of the membranes and fœtal head should be chiefly in relation with the lower medulla and the uterus, while those which come to be excited at the time of full dilatation of the os uteri should affect the medulla oblongata, and the muscles engaged in the act of vomiting, including a considerable number of the muscles of respiration. Another singular affection of the muscular system now occurs. A very distinct shivering, or rigor of the muscles, is often observed at the time when the os uteri is completely dilated. This rigor is very similar to the shuddering produced by the dilatation of other sphincteric muscles. Many persons experience this when the first morsel of food at a meal is passing the cardia, when the urine first passes in micturition, when a catheter is passed, or when the sphincter ani first dilates. These rigors, accompanying the full dilatation of the os uteri, are sometimes so severe and continued as to excite alarm, lest they should pass into general convulsions; and this is, in fact, one of the modes in which the invasion of the puerperal convulsion sometimes occurs. The last act of the stage of dilatation is the rupture of the membranes, and the entire or partial discharge of the liquor amnii. The membranes having acted as an efficient dilator of the os uteri, as far as it dilates by mechanical distension, suddenly give way, and the uterus becomes smaller in compass, contracting more closely and powerfully upon the fœtus. As long as the membranes are unbroken, the circulation in the uterus is not materially interfered with, and the contractions are not so powerful as they afterwards become, on account of the disadvantages under which the uterine fibres act. But as soon as the waters are discharged or diminished, the uterus contracts more closely upon the fœtus, and prepares itself for the stage of propulsion, which we shall next have to consider. The circulation in the uterus, and consequently the changes going on in the placenta, are then considerably interfered with; so that the stage of propulsion is of much greater moment to the life of the fœtus than the stage of dilatation, which is now brought to a conclusion.

In the Stage of Propulsion, the presenting part of the child is passed on from the middle portion of the pelvis to the ostium vaginæ. At the time when this stage of labour commences—namely, the point at which the liquor amnii is discharged, and the os uteri becomes fully dilated, the motor force of parturition is applied in quite a new direction. The direction in which the fœtus has now to pass is in that of the axis of the lower part of the pelvis, which is forwards and downwards. It is at this point that the expiratory muscles come into play, particularly the abdominal muscles, and thus the new direction is provided for. Before the dilatation of the os uteri, we had to consider the fœtus as an ovoid mass, and the axis of this ovoid corresponded with the axis of the uterus, and the axis of the inlet of the pelvis. After the dilatation, we may speak of two axes of the fœtus—one, the axis of the head, in its long or occipito-mental diameter; the other, the axis of the body of the fœtus. Now, the axis of the head, in a natural presentation, becomes nearly the same as the axis of the outlet of the pelvis, through which it has to traverse; and the fœtal body being flexible, readily passes, as it descends, from the direction of the superior to that of the inferior pelvic axis. All these correspondences cannot fail to strike the attention, but they are only a few of those which accompany this stage of parturition. I have already mentioned the advantage given to the uterus by the rupture of the membranes. The same circumstance is equally favourable to the action of the abdominal muscles. A further adaptation, therefore, becomes visible in the precise time at which the liquor amnii is discharged. When the bulk of the uterus is increased by the liquor amnii in addition to the fœtus, the abdominal muscles are so distended that they can only act with difficulty. But after the diminution of the size of the uterus by the discharge of the waters, the abdominal muscles are more free to act, and it is now that they are called upon to aid in the expiratory actions which propel the head of the child through the vagina. When voluntary movements of expiration are unadvisedly made during the stage of dilatation, they are always awkward and fatiguing to the patient; but during the stage of propulsion, the contractions of the abdominal muscles are so powerful as to be no inconsiderable stimulus to the uterus itself. I mean, that besides the direct expulsive power, the pressure they exert upon the uterus excites this organ to more powerful action. Thus, in this stage of labour, when the uterine contractions flag, they can sometimes be renewed by voluntary contractions of the expiratory muscles.

But there is a cause for the intervention of the respiratory system, as well as the sign of its utility. In the stage of dilatation, the ovarian and uterine nerves were the chief amongst the excitor nerves of the motor actions which then occurred. As soon, however, as the fœtal head, protruding through the os uteri, begins to press upon the vaginal surface, a new set of excitor nerves become implicated. The vaginal excitor nerves are the excitors of the expiratory actions of parturition. As long as the internal surface of the uterus alone is irritated, whether by the fœtus, a polypus, or other bodies, the uterus contracts by itself; but as soon as the vagina is impinged upon, the expiratory force is brought to bear. Another point worthy of observation is, that the excitor nerves of the uterus, except at the extreme dilatation of the os uteri, when the stomach was disturbed, were chiefly in connexion with the lower portion of the spinal marrow; but the vaginal excitor nerves are in relation both with the lower medulla and the medulla oblongata. By the lower medulla, and the excitor and motor nerves in relation with it, reflex actions of the uterus are produced by excitation of these nerves; while all the reflex actions of the respiratory system depend upon the medulla oblongata. If the spinal marrow were divided in the middle, there would probably be no respiratory action in parturition, unless the pneumogastric can act as an excitor during labour. Voluntary efforts, and the forcible efforts of emotion, are often mixed up with the pains; but the respiratory acts of this stage of labour are truly reflex in their nature. The expiratory actions occur during the insensibility of puerperal convulsions, when emotion and volition are both suspended. If they were not reflex and physical in their nature, the exhaustion following a strong labour would be far greater than it is. It is a principle of reflex action that it induces no fatigue. Hence we see even weakly women making powerful efforts, but perfectly refreshed between the pains, and easy and composed after several hours of severe labour, complaining of nothing beyond the mere soreness of the muscles consequent upon their energetic contractions.

It may be well to describe minutely the motor phenomena of the contractile part of a pain in this stage. At the coming on of each pain, the patient takes a deep inspiration, as a preliminary. Expiration then takes place slowly and forcibly, in a succession of gasps, and when the air in the thorax is diminished, it is suddenly removed by hasty inspirations. Each pain consists, as far as the respiratory muscles are concerned, of several sudden and deep inspirations, followed by prolonged and laborious expiratory efforts, with the glottis partially or entirely closed. At the acme of a pain in this stage of labour, the glottis and cardia are entirely closed, the glottis only opening partially at intervals, and the abdominal and all the other ordinary and extraordinary muscles of expiration being forcibly contracted. The diaphragm remains inert, as in vomiting, with the actions of which, except that the cardia is closed instead of opened, the efforts of the expiratory muscles in labour may be compared. Obstetric writers have taught that the diaphragm contracts in this stage; but if it be considered for a moment that the diaphragm is a muscle of inspiration, while the actions of parturition are expiratory, the fallacy of such a view of the action of the diaphragm must at once appear. Of the contraction of the abdominal muscles during this stage of labour there can be no doubt; and the actions of the diaphragm and abdominal muscles are antagonistic. It is true that the floor of the diaphragm, instead of being arched, as in an ordinary state of relaxation, remains plane, during the efforts of inspiration, with the glottis closed; but this is from the mechanical distension of the chest by the contained air, not from an active contraction of the muscle itself. Besides these actions, which are involuntary and reflex, the patient voluntarily aids in fixing the thorax by holding some fixed body with her hands, or planting her feet firmly. More than this, she increases all the expiratory actions by strong efforts of the will, and by that emotion of labour which impels her to brave every suffering to effect the birth of the child. At length, when the pain can no longer be borne, the short gasp or groan is exchanged for a cry which dilates the glottis, and the pain and contractions subside. This cry is a motor action, excited by the emotion of pain, and instantly relieves the uterus of all extra-uterine pressure. Thus, the glottis may be compared to a safety-valve, which is thrown open by emotion whenever the pressure becomes more than can be borne with safety. By the influence of volition we have this valve entirely under our control, to open or close it, as may be necessary. When the expiratory actions are weak, we can enjoin the patient to hold her breath, and when they are too intense and too long continued, we can encourage her to cry out, which is of course equivalent to dilating the glottis, and expiring the contents of the thorax. During all this time the uterus contracts powerfully. The dilatation of the perinæum is an important part of this stage of labour. I have already referred to the provisions which exist for the dilatation of this part of the parturient canal, in the arrangement and attachments of the perinæal muscles. The dilatation, thus favoured, is effected by the wedge-like action of the head. Throughout the whole of labour the passages are plentifully lubricated by the bland alkaline mucus secreted by the glands of the canal of the cervix uteri.

In the Stage of Expulsion, the different parts of the fœtus are successively expelled through the ostium vaginæ; the outlet formed by the vulva, the pubic arch, and the perinæum.

This stage of labour is the shortest of the whole progress, but it is the most important and decisive. The actions of the propulsive stage continue with unabated vigour. The uterus contracts with full power, and the respiratory muscles act with immense force. The intervals between the pains diminish as the close of the struggle approaches; and there is often a perfect storm of uterine contractions, without sufficient intermission to enable us to say distinctly where one pain ends and its successor begins. When the fœtal head is actually passing the ostium vaginæ, a new set of actions make their appearance. The perinæum, after being distended to the utmost, is now retracted over the head by the action of the levatores ani; the sphincter ani and the sphincter vesicæ dilate suddenly, the vagina contracts upon the advancing mass, and the head glides rapidly into the world. The dilatation of the two sphincters, between which the vagina is placed, compensates admirably for the absence of a perfect sphincteric muscle at the outlet of the parturient canal. The effect of this double dilatation is, that at the precise moment when there is the most imminent danger of laceration, there is a sudden and considerable removal of tension from the parts endangered. The dilatation of the sphincters is partly dependent on the sensation and emotion of severe pain, and partly on the reflex dilatation peculiar to the sphincteric muscles. This view of the subject gives importance to the defecation, which frequently occurs at this time, and which has been looked upon only as a disagreeable *contretemps*. Physiology here, as in many other instances, transmutes the meanest actions of the economy, and renders them noble by virtue of their uses. At the same moment that the orifices of the rectum and bladder are thrown widely open, there is generally a dilatation of the glottis. Even from women who restrain the expression of their emotions during the rest of labour, a cry of pain escapes at this juncture; this cry is necessarily accompanied by an open state of the glottis. The opening of the glottis is not at all accidental or voluntary, but is as regular and involuntary as its closure during the propulsive pains. Its effect is suddenly to take away the expiratory pressure from the expulsive action. Without this combined action of the glottis, and the sphincters of the rectum and bladder, for the defence of the ostium vaginæ, recto-vaginal laceration must be a more common accident of parturition. Such would inevitably be the frequent result of closure of the abdominal and thoracic cavities at all points, except that of the point of exit for the fœtus, in the final throes of labour.

Altogether, it must be conceded that parturition is the most voluminous of all the motor functions. The human uterus contracts sometimes sufficiently to render the hand of a strong man powerless. In order to illustrate the wonderful muscular power of the heart, the circulation of the whale or the elephant is often referred to by physiologists; but enormous as is the power of the heart in these animals, the parturient actions by which they must bring forth their enormous young give us the most colossal idea we can entertain of any single muscular action. In the human subject, there is a certain grandeur in the combined efforts brought into play in parturition. In women, even of moderate strength and stature, every voluntary muscle of the body is in strong action; the excito-motor force is in a state of the greatest activity; the uterus, unseen, and without any participation with the will, is making its immense contractions; and emotion imparts strength to both voluntary and reflex actions. A temporary calm follows the energetic actions which issued in the delivery of the mother. After the excessive action in which nerve and muscle seemed strained to the utmost pitch, there comes a sudden and profound repose; there is perfect freedom from pain; every fibre is relaxed; only the uterus now contracts of all the muscles which were so lately struggling. Like some ship which turns from a tempestuous sea into a safe and quiet harbour, the new mother passes from the storm of childbirth into the tranquil haven of maternity. In the pathetic words of Scripture, "A woman when she is in travail hath sorrow, because her hour is come: but as soon as she is delivered of the child, she remembereth no more the anguish, for joy that a man is born into the world."

In the Supplemental Stage, the placenta is detached and thrown off, and the uterus contracted, so as to prevent the occurrence of hæmorrhage.

While the body of the child is born by the motor actions I have been describing, the contracting uterus follows closely upon it in its descent, and the action of the uterus, excited at this time from the immense irritation of the vagina by the advancing fœtus, is frequently sufficient to throw off the placenta, and lodge it in the upper part of the vagina. When the placenta is not separated in this way by the last expulsive pain, it remains quietly in the uterus until the appearance of the first after-pain. During this interval the uterus contracts with tolerable firmness, under the influence of the excitement of the act of expulsion. If the placenta has been expelled into the vagina, its presence in this situation excites, after awhile, bearing-down pains and contraction of the vagina, similar to those of propulsion and expulsion, only far more inconsiderable, generally requiring slight traction of the cord to complete its removal. When the placenta remains *in utero*, it becomes separated from the uterine surface by the contractions of the uterus, and by the arrest of the circulation in the umbilical cord. It is then removed by a miniature copy of labour itself; there is a dilatation of the os uteri, and there are the propulsive and expulsive actions of the uterus and the expiratory muscles on a small scale.

After the expulsion of the fœtus, the first act of the uterus is to contract, so as to prevent the occurrence of hæmorrhage. This contraction is induced, in the first instance, by the concluding irritation of the vagina and perinæum on the exit of the fœtus. It is subsequently insured by a succession of stimuli. Of these, some are uterine, others are extra-uterine. The bulk of the placenta and membranes irritate, in the first place, the now contracted uterine surface. When placental separation has occurred, the abraded surface of the uterus is strongly excitor; and as the placental mass passes through the vaginal passage and ostium vaginæ, excitation, which insures full uterine contraction, is supplied. It is a peculiarity of the utero-vaginal canal, that at the termination of labour all the surfaces are more instantly excitor, and the answering motor contractions become more rapid and more easily provoked. During severe labour, irritation of the os uteri, or of the vaginæ, will often increase the pains only in a moderate degree; but now, the introduction of the hand into the vagina, and irritation of the os uteri, will excite instant and forcible contraction of the uterus. The extra-uterine excitors of uterine action also come into play in a remarkable manner. As soon as the child is put to the breast, the slight irritation of the mammary excitor nerves excites distinct contractions of the uterus. This reflex relation from the breast to the uterus continues for several days after parturition, until, in fact, the uterus has returned to the natural state. When the secretion of milk is established, there is, at every afflux of blood to the breasts causing the sensation termed by women "the draught," an answering contraction of the uterus. A reflex relation between the stomach and the uterus is also now set up. Every time the patient drinks her gruel, or takes her tea, sharp contractions of the uterus, after-pains, in fact, are excited. Emotion is another aid to the permanent contraction of the uterus. Any emotion of the mind will generally produce an after-pain, but the maternal emotion especially. The emotion produced in the mind of the mother by suckling her infant induces contraction. A day or two after labour, merely presenting the infant to the mother, without its actual application to the breasts, will excite the sensation of the draught in the mammæ, accompanied by a sudden secretion of milk, and also by contraction of the uterus. Thus the close of labour, the return of the uterine system to the quiet of the unimpregnated condition, is as plentifully provided for as the commencement, or any of the various stages of the process. For some days after labour, the contraction of the uterus is of an active sphincteric kind, but its vascular and other tissues rapidly diminish in size, and it soon becomes, to a great extent, a non-motor organ, as before the time of conception.

CHAPTER XXIV.

THE MANAGEMENT OF NATURAL LABOUR.

The first summons to a lying-in woman should always be promptly obeyed. Some women alarm themselves before labour has really commenced, or when their labours are going on slowly; others defer sending for the accoucheur until the labour is far advanced, or parturition may take place so rapidly, that the medical man, even when using the greatest promptitude, may be too late, or arrive only just in time to afford his assistance. We should always act in practice as though our cases were those of the latter kind, on the ground that it is much better to be many times too soon than once too late. If we are called unnecessarily early, we can leave the patient confidently for a time; but the attendant is sure to obtain blame should anything go wrong before his arrival. Another rule for the accoucheur should be, that of never leaving one case for another, after he has commenced his attendance upon the first, as he is legally and morally responsible, in the event of accident, for the conduct of any case the actual attendance upon which he has undertaken.

The matters required by the accoucheur during the conduct of a labour are, a case containing a flexible stethoscope, a blunt-pointed scissors, a silver or gum-elastic female catheter, laudanum, sal volatile, and ergot of rye. The nurse should provide thread for tying the funis, an abdominal bandage, and a supply of napkins and hot and cold water.

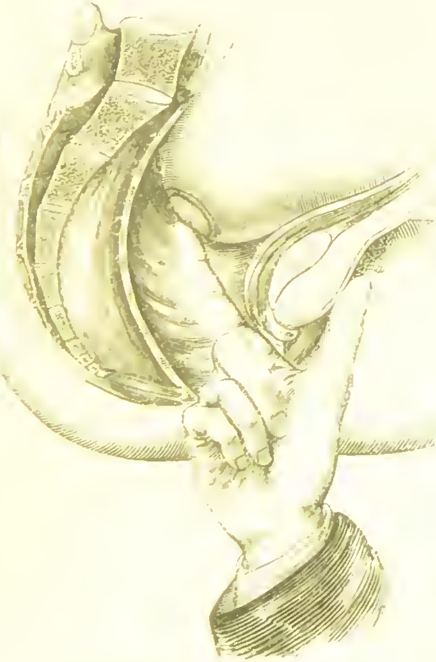
At the first visit to a patient in whom labour has apparently commenced, an examination should invariably be made. This should not be proposed abruptly, particularly when the accoucheur is not well known to his patient. Inquiries may be made about the state of the bowels and bladder, the nature of former labours in multiparous cases, and other points upon which it may be well to have information. The accoucheur should not, however, on any account, leave the patient without ascertaining the nature of the case under his management. It may happen that no pregnancy exists; or the case may be one of arm or funis presentation, requiring early interference, with a view to the safety of the mother or the fœtus. But in the most natural cases, it is always a comfort and ground of confidence to the patient, and a satisfaction to the accoucheur, to know that everything is "Right," as the phrase is when the fœtal head presents.

The usual obstetric position in this country is that in which the lying-in woman is placed on her left side, with her head upon a pillow, and the thighs and legs flexed. She should be placed with her back towards the edge of the right side of the bed. In the Stage of Dilatation, before the os uteri has opened, and when the pains are not immoderate, the patient may be allowed to choose her own posture, except during an examination. She may walk about, and occupy herself with the preparations for the coming infant, or other casual matters. The pains may be borne in a sitting or standing position, as may seem most easy. No voluntary efforts or straining at this time should be permitted. The more freedom we allow, of course in moderation, to the patient during this stage, the less fatigue she will feel during the succeeding stages of labour. When the stages of propulsion are proceeding, she should be advised to lie upon her left side in the manner already pointed out. This seems to be the most convenient position, and one often assumed by patients naturally, or in cases where women are delivered without assistance. But even after the stage of dilatation has passed, no great constraint should be exercised. If the labour be long, women become cramped and sore from continuing several hours in the same position, and the pressure exerted by the fœtus is more distressing than when occasional change of posture is allowed. Amongst poor women in this country, the usual dress is worn until the completion of labour. With the rich, the custom is either to wear a dressing-gown during the stage of dilatation, or to remain in bed during the whole of labour. The bed should be prepared by the nurse with a drawn sheet, and a leather, or piece of india-rubber sheeting, to defend it from the discharges.

In "Taking a Pain," as it is termed, the accoucheur sits or stands by the side of the bed, the patient's back being towards him. This is one advantage in the position on the left side, as it enables the attendant to make the necessary manipulations while her face is turned away from him. With an expert and careful nurse, the patient will be placed on her side, and the clothes so arranged that a little fold of the chemise or night-dress will be brought to the edge of the bed, along which the accoucheur can introduce his hand without impediment until it reaches the vulva. Otherwise, the dress may be wrapped round the legs, and the attendant has to disentangle it before he can make the necessary examination. The position of the hips is obvious, and the better plan for the student is to introduce the right hand between or at the back of the heels, and pass it up towards the nates. The posterior fourchette should be felt for, the vulva separated by the two forefingers or the finger and thumb, and the forefinger introduced along the vagina in the direction of the axis of the pelvic outlet. The experienced accoucheur will have little difficulty in passing his hand straight to the vulva without any such precautions. Guiding the finger along the vagina, the os uteri is felt, in the early part of labour, pointing towards the upper part of the sacrum, and the presentation can be made out as described when treating of the mechanism of labour.

If the os uteri cannot be reached with the forefinger of the right hand, the two forefingers of the left hand should be introduced, as they can be passed higher than the forefinger of the right hand. Some distinguished obstetricians always use the second finger of the right hand, because of its length; others, the two first fingers of the same hand, with a view to trying the dilatability of the os uteri and vagina. As a rule, no opinion respecting the presentation should be given unless the finger can be passed within the os uteri, and the presenting part felt, either by itself or through the membranes. If the young accoucheur contents himself with feeling the presenting part through the anterior wall of the cervix uteri, without getting within the os, he may sometimes mistake the back or shoulder for the head, and have to make some awkward explanations to the patient or those around in case of such an error. Besides ascertaining the exact presentation, we acquire by the first examination a knowledge of the state of the os uteri, the extent of its dilatation, its dilatability, the condition of the vagina and perinæum as regards sensibility and distensibility, the amount of lubricating secretion in the passages, the state of the rectum as regards fulness or emptiness, the capacity of the pelvis, and some general idea of the size and state of ossification of the fœtal head, the tumour of the scalp, the rupture or integrity of the membranes, the quantity of liquor amnii, the height of the presenting part in the pelvis, &c. In all examinations, the fingers used should be smeared with cold cream, olive oil, or glycerine. As a general rule, the forefinger is the one most conveniently used by the accoucheur, but no representation which I have seen accurately portrays the mode in which it is used in an examination. In an examination in the early part of labour, when the os uteri is high in the pelvis, the arm and wrist are rotated so that the palmar surface of the base of the finger comes almost in contact with the pubis, and the os uteri is explored with the radial and middle surface of the palp of the finger. (Fig. 111.) This is, I believe, accurately represented in the accompanying engraving. In examinations in the latter part of labour, when the os is dilated and the head low down, the finger may be used in almost any direction with equal ease.

FIG. 111.



Examination in the stage of dilatation.

When the obstetric student examines in his first case of labour, he commences an education of the Sense of Touch, such as is neither necessary nor acquired in any other department of practice. In tactile examinations of other parts of the body, the senses of sight and touch, or sight, touch, and hearing, are combined; but in the examinations of the accoucheur, touch is exercised without any assistance from the other senses. The obstetrician who has by long practice acquired the *tactus eruditus* in perfection, may almost be said to have the end of his finger armed with an eye, and he reads the varied conditions of the internal parts which are within reach, as accurately as the blind scholar reads the raised type in which books for the blind are printed. Although the forefinger of the right hand is that generally used, and which seems capable of acquiring the highest tactile education, it is well to accustom ourselves to use the other fingers, in case of being disabled in the right hand by any accident, or in the event of some unusual shape of the pelvis or soft parts.

We are commonly told to introduce the finger during a pain, and indeed the phrase, "Taking a Pain," implies that we can at this time afford some assistance to the patient. Hence women more readily submit to examination when a pain is coming on than during the intervals. Formerly, when the principal object in making an examination was to ascertain the strength and efficiency of the uterine contractions, it was better to examine during a pain than at any other time. But since the mechanism of labour has been better understood, and we require to ascertain the exact position of the head during its progress, it is necessary to examine in the intervals as well as during the presence of the pains. If we introduce the finger while the uterus is contracting, we should be careful not to rupture the membranes prematurely, as they are tense and thin at this time. The presence of the amniotic bag, and, after the escape of the liquor amnii, the corrugation of the scalp, or the increase in the caput succedaneum during the pains, prevent us from making out the relative position of the sutures, as well as in the intervals between them. An examination, therefore, should always occupy a pain and part of an interval. Having ascertained the nature of the presentation, and the state of the parts within the vaginal canal, no other manual interference is required in natural cases, during the stage of dilatation, beyond an occasional examination, to ascertain the rate at which the labour is proceeding. We shall, however, be expected to give some idea as to the time when the delivery may be completed.

A labour is considered natural as regards time when it does not exceed twenty-four hours from the commencement of the dilatation of the os uteri to the completion of delivery. Primiparous women frequently, however, exceed this period, and multiparous women are commonly delivered in a much shorter space of time. The full dilatation of the os uteri is considered to occupy five or six hours, but in many cases it takes less, and in others more than this. The bony pelvis being normal and the pains natural, labour is quick in proportion as the os uteri and perinæum are dilatable, and the vagina short and capacious; and tedious according to the rigidity of the os uteri and perinæum and the length and contraction of the vagina. Sometimes one portion of the parturient canal is relaxed, and another contracted; under these circumstances, one part of the labour will be rapid and the other slow and tedious. It is only by experience, tact, and an appreciation of all the circumstances which modify the progress of labour, that anything like certainty of prognosis as regards its duration can be acquired. In parts previously rigid, the disposition to dilate may be suddenly manifested; or the os uteri, after dilating favourably to a certain extent, may become immoveable. As regards uterine contractions, we may have a sudden failure of active pains, or pains in cases which have been sluggish may become as suddenly energetic. It behoves, then, that the young practitioner should, as the rule, be almost as guarded as an oracle in his vaticinations respecting the time of the termination of labour in any given case.

During the Stage of Propulsion, we may moderate and guide the pains by inducing the patient to cry out if the pains are excessively violent during the expiratory efforts, or to hold her breath, and add voluntary straining to the reflex actions of the respiratory muscles, if the pains are feeble. In thus managing the open or closed state of the glottis, we can always increase or diminish at will the force of the uterine and respiratory contractions. As a rule, the membranes are ruptured spontaneously at the commencement of this stage. We should be especially careful not to rupture them in ordinary cases before full dilatation of the os, if we can avoid it. When the stage of propulsion is fully formed, we may generally rupture the bag with advantage if this has not already occurred. This may be done by the nail of the forefinger during the height of a pain. When the membranes are tough, several efforts during successive pains are necessary before the membranes can be broken, but no violence should be used. Sometimes cases are met with in primapara in which the quantity of liquor amnii is so small, that it does not, from its bulk, interfere with the uterine action, and in which the labour goes on so satisfactorily, that it is advisable not to rupture the membranes until the perinæum is dilated, and the head presents at the ostium vaginæ. When the amount of fluid is large, it very much facilitates the progress of labour to evacuate it as soon as the os uteri is fully dilated, or even before this period. If the membranes are punctured, accidentally or intentionally, when the liquor amnii is not in excess, before the stage of dilatation is completed, it frequently happens that the os uteri, which had been dilating most favourably, becomes rigid and contracted, and labour is impeded for several hours. On the other hand, cases are occasionally met with in which the os is dilatable but the uterus inactive, and in which dilatation may be promoted by the evacuation of the liquor amnii; but these are exceptions to the general rule. There is another point in the management of the liquor amnii worthy of notice. It sometimes happens that the head is well engaged in the pelvis before the liquor amnii begins to escape, and the proportions between the head and the parturient canal are so exact, that no water flows away in the intervals between the pains, or during the greater part of the pains themselves. The head and canal act exactly as a ball-valve, and no fluid can pass except at the acmé of a pain, when the force which should advance the head is expended in a slight dribbling of the waters. Much time is often lost in this way, and the best mode of obviating the difficulty is to drain off the liquor amnii through a small gum-elastic catheter passed up by the side of the head. Nausea and vomiting are always beneficial during the progress of natural labour. In the stage of dilatation they aid in dilating the os uteri by the mechanical straining which occurs, as well as by the reflex sympathy between the cardia and the os uteri, and the general relaxing effects of sickness. In the stages of propulsion and expulsion, also, they increase the expulsive efforts, and relax the vagina and perinæum.

When the dilatation of the os uteri is very difficult, the margin of the os being hard, thin, and painful, nauseating doses of tartar emetic are very useful. The inhalation of chloroform also has a very beneficial effect in cases of rigidity. Sometimes, when the tenderness and spasmodic rigidity of the os uteri is very great, and when chloroform is not administered, an opiate will be of great service; or a moderate bleeding may be practised when the patient is of plethoric habit. I have tried belladonna, and a solution of atropine, in such cases, but without any marked effects. During the stage of dilatation, and in the early part of the propulsive stage, the direction of the axis of the uterus should receive special attention. It should be as far as possible kept from anteversion, retroversion, or obliquity on either side, as these departures from its proper axis are certain to impede labour.

From time to time, during every labour, the condition of the fœtal heart should be ascertained. This can easily be done by means of the flexible stethoscope mentioned as one of the requisites of the accoucheur, and the knowledge thus acquired will sometimes become of great use in labours apparently the most uncomplicated. The accoucheur should never forget that in a case of labour, two lives are under his care, and that both require his attention. In no point is the excellence of the Dublin school of Midwifery more unequivocally shown than in the care with which its best teachers advise that auscultation of the fœtal heart should invariably be practised during the progress of labour where the child is living.

The spirits of a lying-in woman should be kept up as much as possible, and this is best insured by cheerfulness and composure in those around her. The lying-in room should not be crowded, and from time to time the accoucheur should retire, so that no constraint may be placed upon the bowels or bladder of the patient. She should be allowed very nearly her usual diet, in the early part of labour, if her stomach can bear it, and there is no special contra-indication.

In the Stage of Expulsion, the chief points are, the regulation of the expulsive forces, the direction of the head, and the preservation of the perinæum. In the latter part of labour, the glottis is to the parturient function almost what the safety-valve is to the steam-engine. By opening the glottis, as by directing the patient to cry out; or by closing it, as by directing her to hold her breath, we can, to a very great extent, regulate the expulsive efforts of the last and greatest stage of labour.

Many conflicting opinions prevail as to the propriety of supporting the perinæum. Some years ago I pointed out that pressure on the perinæum excites reflex contractions of the uterus—a point which is, I believe, now pretty generally recognised; and I grounded upon this circumstance, and upon the facts that, in cases where pressure or support is most assiduously rendered, laceration sometimes occurs, while it rarely happens when women are delivered by themselves, an objection to the constant and sustained support to the perinæum during the latter part of labour. I believe that long-continued pressure tends to produce the accident, by increasing the expulsive pains and by damaging the perinæum itself. We read of cases in which the perinæum has been supported for many hours in succession, which must certainly always be unnecessary, since, if the pains are strong enough to threaten laceration, the expulsive stage could not last the time described. My advice with regard to the perinæum is, that the forefinger of the left hand should be kept upon the anterior margin of the perinæum during the last pains, and the right upon the head, with a view to ascertain the moment when the perinæum is distended to a dangerous extent with one hand, and at the same moment to retard the advance of the head with the other. The head should be pressed, in passing, close to the pubis, so as to strain the perinæum as little as possible. If we prevent the rapid passage of the head, we do more to prevent laceration than can be accomplished by the most careful pressure or support of the perinæum.

The knowledge of the mechanism of labour is of importance, not only with reference to diagnosis and the use of instruments, but in the management of natural labour. Sometimes, the descent of the head through the pelvis is retarded by the imperfect flexion of the head, or dip of the occiput. When the two fontanelles are on the same level, or nearly so, the occiput may be brought down by traction exerted with the finger on the ridge formed by the lambdoidal suture; by the use of the vectis; or by upward pressure on the frontal or anterior portion of the parietal bones. Rotation of the head may be assisted by gentle pressure upon the occiput, or upon the portion of the parietal bone, next to the ischial planes upon which the head is descending. At the time of the exit of the head, its extension, or the separation of the chin from the sternum, and the descent of the forehead and face over the sacral and perineal surfaces, may be aided by exerting slight pressure upwards upon the vertex, and traction downwards upon the frontal bone. As soon as the head is liberated, it should be ascertained if the cord be twisted round the neck, and the loop should as gently as possible be passed over the head in order to free the funis from pressure. The rotation of the shoulders in the reverse direction to that taken by the face, so as to bring the shoulders into the opposite oblique direction to that occupied by the head, may be aided by placing one hand upon the back of the neck, and the other upon the sternum as the shoulders are passing. As the body of the child passes, it should be carried up somewhat over the pubis. These aids can only be afforded after an accurate knowledge of the mechanism of labour has been acquired, but they may then be made very considerably to facilitate the progress of delivery.

The old axiom, "Meddlesome Midwifery is bad," has had great force in obstetric practice, but it is, perhaps, better adapted to ignorance or partial knowledge, than to a perfect comprehension of the mechanical and motor phenomena of natural labour. I have no doubt the time will come when both will be so well understood that the finger and mind of the accoucheur will be in accordance with every change in the passage of the child during parturition. Proverbs are always one-sided. The phrase quoted has, no doubt, been useful in preventing improper interference, but it has also a tendency to the prevention of interference when this is both useful and necessary.

During the propulsive and expulsive stages, it is usual for the patient to aid the respiratory efforts, by fixing her feet and pulling at a towel with the hands, or holding the hands of the nurse. This exertion must be encouraged or discouraged, according to the power of the pains. When the head is passing through the vulva, the right knee should be raised so as to facilitate its passage. Throughout the whole of labour the woman derives comfort and relief from pains in cases where anæsthesia is not produced, from pressure exerted by the hand of an attendant upon the sacrum during the pains.

After the birth of the child, the umbilical cord requires to be tied. The ligatures should be formed of thread, doubled several times. It should be tied firmly about two inches and a half or three inches from the umbilicus, and a second ligature is generally applied at a little distance from the first, towards the placenta. Considerable force must be used in tying the cord, in cases of a large funis from the deposition of an unusual quantity of the gelatinous matter constituting the bulk of the cord. Otherwise, the vessels may not be compressed, and bleeding may occur. In cases of large cord, it is always well to look at the funis a short time after the application of the ligatures and division of the funis, to see that no hæmorrhage is going on. The second ligature is intended to prevent hæmorrhage from the divided cord in cases where there are twins with a single placenta, or where the vessels of two cords inosculate, as they sometimes do. When we have ascertained that there is no second fœtus, by placing the hand upon the abdomen of the mother, the second ligature is quite superfluous, and an ingenious friend of mine, Mr. Duckworth Nelson, tells me that he always allows the slight bleeding from the cut extremity of the cord to take place, with a view to emptying the fœtal portion of the placenta. This probably favours the separation of the placenta, and tends to prevent post-partum hæmorrhage. In dividing the cord, a pair of blunt-pointed scissors should be used, and the division should never take place under the bed-clothes, as the penis, or fingers, or toes have been sometimes injured during the separation of the funis. After the expulsion of the placenta, the abdomen should be again examined, to learn whether the uterus is contracted. It ought to be felt above the pubis, or at the pelvic brim, of the shape, and almost the hardness, of a cricket-ball.

A short period of repose to the mother follows upon the birth of the child, but in a few minutes uterine contractions are again felt. The placenta may have been detached by the pains which effected the delivery of the head and trunk, or it should now be separated from the uterus. When the pains recur at the time mentioned, gentle traction should be exerted upon the cord, the hand of the nurse being placed upon the abdomen, and exerting gentle downward pressure. If there should be no pain, the finger should, in the course of ten minutes from the expulsion of the fœtus, be introduced into the vagina, and the stringy insertion of the cord into the placenta will generally be felt; or, if not, the fundus uteri should be irritated by the hand externally, so as to cause contraction; and the placenta may be swept, as it were, downwards by the ulnar edge of the palm of the hand. In extracting the placenta, slow and gentle traction only should be used, as by this means the whole of the membranes, and any coagula which may have formed, are likely to come away with the placenta. The cord should be drawn downwards by the left hand, the fore-finger of the right being placed upon the insertion of the cord, as it is here that laceration occurs, when it gives way. Of course, if the cord is breaking, the traction should cease, and the placenta ought to be drawn forth by the fingers. As the rule, the placenta should be examined, to be sure that no portion of it remains *in utero*. Upon the removal of the placenta, the fingers of one hand should always be introduced into the vagina, while the uterus is gently squeezed by the other, and any coagula which can be found should be removed. It should always be borne in mind, that a retained clot, a shred of membrane, or a piece of placenta, may subsequently imperil the life of the patient by becoming putrid and absorbed. After the delivery of the placenta, a bandage should be applied to the abdomen, with a view to gentle and moderate compression of the uterus, and the support of the vascular system of the mother, after the tension of the abdomen during pregnancy. No doubt, by forcible compression after parturition, injury may be done to the uterus; but I have known cases of mortal fainting occur in patients where no other cause of death could be assigned than the neglect of bandaging. I therefore strongly recommend it, and all the more particularly as its employment has been questioned in recent discussions. When the bandage has been applied, the mother is allowed to rest while the child is being dressed, after which she is made comfortable by the nurse. The child should be put to the breast within a few hours after delivery, but should not suck frequently until the secretion of milk is established, otherwise the mother suffers more than is necessary from after-pains, particularly in multiparous cases.

As soon as the child is born, the first attempts at Respiration usually occur immediately, the first inspiratory movements being excited as a reflex action, by the influence of cold upon the surface. The diaphragm is the special muscle of inspiration, and this is the first to act in the establishment of respiration in the new-born infant, as it is the last to relinquish its functions, in a case of death from asphyxia.

The child may, from a variety of causes, be born in a state of Congenital Asphyxia, in which instant and energetic efforts become necessary for its restoration. The chief causes of this condition are such a continuous contraction of the uterus during labour as to interfere with the due supply of blood to the maternal side of the placenta, partial or entire placental detachment before the time of birth, and continued pressure upon the umbilical cord. The child may also be asphyxiated by being born, in the absence of the attendants, enveloped in the membranes, or "Caul," so as to render respiration impossible.

The signs of congenital asphyxia are failure of the fœtal pulse, and spasmodic movements of the presenting part of the child occurring for some time before death at tolerably regular intervals. When the child is born asphyxiated, the surface is very dark, from the injection of the capillaries with venous blood. It becomes necessary to understand the nature of the intermittent spasmodic movements just mentioned, with a view to treatment. When the blood of the fœtus becomes entirely venous, it stimulates the medulla oblongata, as proved by the experiments of Schneider, Volkman, and others, so as to produce gasping efforts of a respiratory character. These movements are termed Centric, to distinguish them from the Excentric or Reflex movements, dependant on external stimuli. They occur *in utero*, in precisely the same way as when the fœtus is exposed to the external air.

The first movements of children who are born in a state of asphyxia, and who are recoverable, are of this kind, and these centric movements will sometimes of themselves slowly establish healthy respiration, the intervals between the gasping efforts becoming smaller, and the movements themselves becoming changed into the ordinary reflex respiratory movements. It is seldom that a child can be restored after the cessation of these centric movements, notwithstanding that the heart will frequently beat for some time after they have ceased. The younger the fœtus, the longer is the time occupied in the act of dying, and the greater the chance of resuscitation.

The ordinary means of establishing respiration in cases of partial asphyxia consist of sprinkling cold water on the face or chest of the new-born child; slapping it on the sides or breech; pinching the ears, or irritating the eyelids or anus; rubbing the nares and mouth with a little brandy or sal volatile. If the child is very black, a small quantity of blood should be allowed to flow from the umbilicus before tying the cord. In more serious cases, or when the above means are not sufficient, the child is generally put in a bath of about the temperature of the blood, or wrapt in warm flannel and kept near a fire. Alternating with this raised temperature, the child should be sprinkled with cold water, and the limbs and body of the child rubbed assiduously with brandy or spirit. Great care should be taken, in all cases of asphyxia in new-born infants, to cleanse the mouth, nares, and fauces. Artificial respiration may be practised, either from mouth to mouth, or by means of a tube inserted into the mouth or nostril. During these operations the thorax should be alternately squeezed by the hand, and allowed to relax. Artificial respiration is not, however, of so much value in congenital as in other forms of asphyxia, from the fact that the fœtal lung has never been distended with air. The plan suggested by Dr. Marshall Hall has excited much attention of late, and is said to have been successful in a great number of instances. If it should prove efficacious in cases otherwise irrecoverable it will become an invaluable boon. Dr. Hall's method consists in placing the fœtus on its face, with the forehead raised, and rotating it from side to side, so as to induce movements similar to those of natural respiration, and to favour the escape of mucus from the air-passages. These movements should be combined with continuous frictions of the limbs, so as to keep up the circulation as well as possible in the absence of respiration. In cases of congenital asphyxia, when the child has been recovered, the child should be watched carefully during the first twenty-four hours of life, as there is a tendency to the occurrence of what has been termed secondary asphyxia; and the child will frequently be observed to change colour from imperfect oxygenation of the blood. Frictions, and the free exposure of the child to the air, are the best means of preventing this accident. Dr. Hall is opposed to the use of the warm bath in resuscitation from asphyxia, on the ground that it produces faintness and exhausts the remaining powers of life.

CHAPTER XXV.

MANAGEMENT OF THE PUERPERAL STATE.

In the Puerperal State, the patient has to recover from the shock of labour itself, and to pass through the disordered conditions, incident to the state of the uterine cavity and the walls of the uterus after parturition, and to the establishment of the mammary secretion.

The influence of the shock of labour is visible in the lowered state of the pulse which obtains some hours after labour, the debility felt by the patient, and the intolerance of light, noise, and other stimuli previously borne with ease. The shock itself depends on the exhaustion of the nervous system by the prolonged muscular efforts, the physical pain, the loss of blood during the separation and expulsion of the placenta, and the removal of the pressure exerted by the gravid uterus in the latter months upon the other organs of the body. The influence of the shock of parturition is best relieved by an opiate when the labour has been severe, or by natural sleep, quiet, a darkened room, and the prevention of all excitement as far as possible. If the patient be greatly exhausted by labour, stimulus and nourishment may be administered immediately after delivery; but in ordinary cases, gruel, beef-tea, tea and dry toast, or similar matters, should be allowed during the first twelve hours. I give an opiate immediately after labour, or at bedtime, if delivery has been completed in the afternoon or evening, and there is no special contra-indication.

After the completion of labour, the most important considerations respecting the child-bed patient, are those which relate to the internal surface of the uterus. When describing the gravid uterus, I dwelt upon the involution of the muscular structure of the organ after parturition, by the degeneration, disintegration, and removal of the large muscular fibres, and the substitution in their place of the rudimentary cell-fibres proper to the uterus in the unimpregnated state, so that it is not in this place necessary to refer further to the post-partum changes in the parietes of the organ.

If the portion of the internal surface of the uterus be examined within a few days after labour, it is found to be raised somewhat above the other parts of the uterus, because of the increased thickness of the organ in this situation, and the remains of the decidua serotina. The open mouths of the veins are still visible, and small pieces of coagula are hanging from them into the cavity of the uterus. Since the time of Harvey, who was one of the earliest to make the comparison, the state of this part of the uterus after parturition has often been likened to a stump after amputation, or a new-made wound. The comparison is only correct to a limited extent. The small, curling arteries and the veins of the uterus have certainly been divided in the separation of the placenta, but, except at these points, no structural lesion occurs. The portions of the internal surface between the mouths of these arteries and veins are occupied by the remains of the decidua serotina, or that part of the developed uterine mucous membrane lying between the uterine parietes and the placenta. There is no natural formation of pus upon the surface from which the placenta has been removed, as in the healing of an ordinary wound. The portions of coagula hanging from the venous openings separate and are discharged, or remain to plug up the vessels, and the veins and arteries close by a process of gradual contraction and obliteration, under the influence of the contracting uterus and the diminished supply of blood to the organ. There are no evidences, in healthy cases, of any inflammatory action or suppuration at the placental site during the return of the uterus to the size of the unimpregnated state. Besides the coagula hanging from the mouths of the veins, coagula probably exist to some extent, in almost all cases, within the cavity of the uterus, as the remains of the blood poured out during the act of the separation of the placenta or immediately afterwards. Having thus described the condition of that part of the internal surface of the uterus from which the placenta has been separated, we are now in a position to consider the Lochia—a sanguinolent discharge from the vagina, which continues after labour, for a time varying from three or four days to a month, but which generally disappears ten or fifteen days after delivery.

The lochial discharge consists of sanguineous matter derived from the surface of the uterus at that portion to which the placenta has been attached, and of sanguineous *débris* formed in the breaking down and discharge of the whole of the uterine decidua. The dissolution of the small coagula from the mouths of the uterine veins, and coagula found in the cavity of the uterus, furnishes some of the discharge, but the greatest part is obtained from the decidual lining of the cavity of the body of the uterus. From the evidence of numerous preparations and specimens which I have examined, I am convinced that the whole of the decidua, or that modified mucous membrane which has borne and sustained the ovum up to the time of its maturity, which does not come away with the placenta, loses its vitality, becomes broken down, and is discharged during the first week or two of the puerperal period. I have seen the whole of the internal surface of the uterus covered with the bloody exudation thus formed, and the uterus may be found in every stage of progress of throwing off the decidua, from the organ studded with patches of decidua, or completely covered with this membrane, to the perfectly smooth internal uterus, from which the whole of the decidua has been detached; and I look upon this exfoliative shedding of the mucous membrane or uterine decidua, as in many respects analogous to the change which takes place in the uterine mucous membrane at the catamenial periods, and the lochial and menstrual discharges appear to be essentially the same, except that the lochial flow is more profuse than the menstrual. In animals, there is no lochial discharge in the sense in which this discharge occurs in the human subject, because the placental cotyledons, or that portion of the placenta which fulfils the function of the decidua in the human subject, are permanent. No doubt the basement or germinal portion of the uterine mucous membrane remains both after the catamenia and the lochia, and produces the new mucous membrane, found after menstruation and parturition. At first the lochial discharge is of the colour of pure blood, mixed occasionally with coagula. It is passed with the greatest readiness during the times of micturition and defecation, or while the uterus is contracting, as in after-pains. After a few days, the sanguineous character of the discharge diminishes, the flow becoming greenish, and frequently having a disagreeable smell. It is now called the "green waters," and the next change is to a whitish secretion, which gradually ceases. The green colour is caused by the chemical action of the utero-vaginal secretions upon the diminished amount of blood-globules now present in the discharge. The lochial discharge possesses a peculiar smell, similar to that of the catamenia, but more intense.

It is of importance that the lochial discharge should be free. In the event of deficiency, from retention in the uterus or vagina, friction of the abdomen should be practised, with a view to excite contractions of the uterus and the expulsion of any collections in its cavity. Warm water, infusion of camomile flowers, or a weak solution of chloride of lime, should be injected into the vagina two or three times daily, and in cases where actual mischief is apprehended, the cavity of the uterus itself may be washed out. Napkins are worn during the whole continuance of the lochial flow, and the nurse should change them frequently. The change of the napkin promotes the lochial flow, besides being necessary to cleanliness, as the uterine discharges very speedily decompose, and become intensely disagreeable. I have sometimes been obliged to order a bag of animal charcoal, or a piece of prepared charcoal sheeting, to be placed in the bed to neutralise the lochial effluvium.

The After-Pains are the natural attendants upon the uterine contractions which occur after parturition. The uterus is usually felt in a state of persistent and moderate contraction; but from time to time this contraction is increased, and is attended by pain. After-pains increase in severity with every labour; so that primiparous women suffer little from this cause, while multiparous women are troubled with them in proportion to the number of children they have borne. They commence soon after labour, and in the worst cases last three or four days, being produced spontaneously, or by any reflex irritation, such as the draught in the mammæ, the sucking of the child, taking food or drink into the stomach, and the action of the bowels or bladder. Within certain limits, these pains are very salutary, tending to the expulsion of irritating materials from the uterus, and the perfect Involution of the organ, as the reduction of the organ to its proper size is called. Sometimes they occur violently two or three days after the completion of delivery, when the finger should be passed into the vagina, and the os uteri examined, with a view to the removal of any coagula which may remain in the uterus and vagina. When no retention exists, but the pains are neuralgic in character, an opiate, and a warm linseed-meal poultice upon which a little laudanum has been sprinkled, applied to the abdomen, afford great relief. I have sometimes found that an anodyne embrocation applied to the breasts is of service in relieving distressing after-pains. The reflex sources of uterine irritation should be avoided as much as possible. When severe and long-continued, after-pains can never be neglected with impunity, as they sometimes run on to inflammatory disorder.

In most women there is some appearance of Milk in the breasts before the coming on of labour. The areola acquires its deepest shade during and immediately after parturition, and at this time, in women of dark hair and complexion, an almost black zone surrounds the nipple. There is sometimes a pretty free secretion of milk from the beginning, but it is generally the third day before the secretion is fully established. The mammary secretion is, without doubt, dependent upon the internal condition of the uterus already described, being excited as a reflex phenomenon by uterine irritation. The breasts in turn excite the uterus, and these organs mutually contribute to the return of the uterus to the unimpregnated condition, and to the establishment of the mammary secretion. When the milk is first secreted in quantity, there is a great determination of blood to the glands, producing considerable heat, pain, and swelling, which lasts for two or three days in favourable cases. The mammæ often become greatly distended, not only from the secretion and retention of milk, but from tumefaction of the gland itself. The milk first secreted, termed the colostrum, is more irritating than that subsequently formed, and acts as a natural aperient, clearing the bowels of the child from the remains of the meconium, as the secretions accumulated in the intestines during fœtal life are called. Sometimes women suffer considerable pain from the mere weight of their breasts, in which case they require to be supported by a bandage placed round the neck. As soon as the milk is secreted plentifully, the child should be put frequently to the breasts, and they should, besides, be drawn, if necessary, by the nurse, so as to prevent accumulations of milk in the ampullæ, or the galactophorous ducts. Frequent frictions with olive oil, or a mild camphorated liniment, are also very useful, as favouring the flow of milk through the tubes, and diminishing the tumefaction of the glandular lobules. If the breasts are very hot and painful, an evaporating lotion should be applied constantly. The nipple should always be wiped carefully after each drawing of the breast, or the sucking of the infant. As regards the frequency of the application of the child to the breasts, a certain amount of caution should be observed. If there be a profuse secretion, and the glands are not relieved, inflammation and suppuration occur; if the child should be applied too frequently, the secretion is greatly increased, as each act of sucking is at once a relief and a stimulus to the gland, and the patient may be weakened by galactirrhœa. Again, if the glands are swollen, but without any great secretion of milk, and the child is constantly applied, great pain is produced, and the tubes and glandules may become acutely inflamed, and may suppurate from this cause. Mammary abscess during the puerperal month may arise from three causes:—1, the irritation of sore nipples; 2, the distension of the gland, or some portion of its substance and tubes; or 3, the irritation of a feebly secreting gland, by constant attempts at suckling the child. When it is desirable to diminish the quantity of milk, I generally give sulphate of magnesia with or without dilute sulphuric acid, so as to keep up a moderately free action of the bowels, and have the breasts relieved by frequent frictions, resorting to drawing or suckling as little as possible. These means, with in some cases a diuretic, and restrictions as regards diet and drink, I have seldom known to fail. Recently, belladonna applied locally, has been recommended for checking the flow of milk. When we desire to increase the secretion of milk, warm fomentations, and the application of the boiled leaves of the castor-oil plant, with fomentations by the water in which they have been boiled; or the use of a castor-oil embrocation, are very efficacious.

The state of the breasts incident to the establishment of the milk, and the condition of the internal surface of the uterus, often produce a considerable amount of constitutional irritation and fever, known as Milk Fever, Ephemera, or Weed. This is attended by slight shivering, followed by a quick pulse, and is generally relieved by the full secretion of milk and free perspiration. It seldom requires any other treatment than careful management of the breasts, attention to the lochial secretion, and the use of saline aperients and diuretics. It seldom or never lasts more than two or three days, unless it runs on to more serious disorder, or ends in mammary abscess.

The Diet of the puerperal woman is an element of much importance. Up to the time of the establishment of the full secretion of milk, the tolerably free action of the bowels, and the subsidence of the febrile re-action which commonly occurs at the lacteal crisis, the diet should be moderate in quantity and unstimulating. No solid animal food should be taken, as the rule, up to this period. But cases sometimes occur in which the exhaustion is so great, that animal food and stimulus are required from the first. After this time, feeding may begin, and a generous diet be gradually introduced. It must be remembered, that the patient has to recover from the long drain which pregnancy is in itself, and to prepare for the further drain of lactation. The secretions and excretions being carefully regulated, women may live well after the first two or three days from the date of labour. The constitution has to get rid of old material, and to repair losses. These indications are best fulfilled by the maintenance of adequate excretion and nutrition. Numbers of women make bad nurses, suffer unduly from lactation, and become nervous and irritable from being under-fed during the puerperal period. Most of the cases of puerperal mania which I have seen, have resulted from exhaustion produced from various debilitating causes, such as under-feeding, over-nursing, and want of sleep, during the first two or three weeks after labour.

Rest, especially in the early part of the puerperal state, is of great moment. Those who get up too early, suffer from hæmorrhage and prolonged lochial discharge, owing to the absence of valves in the uterine veins, and the momentum of the blood downwards. They are also liable to prolapsus from the weight of the uterus, and the relaxation of the uterine ligaments, and the soft parts of the pelvis generally. With respect to the poor, no absolute limit can be placed, because of their urgent necessities; but, when it can be done, the patient should remain eight or ten days pretty much in the horizontal position, and, after that time, should rest during a portion of the day, until the end of the month.

After parturition, it is natural for the Bowels to be constipated. This, in part, arises from the exhaustion induced by labour in all the organs under the influence of the spinal cord, and, in part, from the small quantity of food usually taken within the first two or three days of the puerperal period. Left to themselves, the bowels would probably pass a week or ten days in a state of inactivity. It is usual and proper to give a mild aperient dose on the third day after labour, and the medicine in most common use for this purpose is castor-oil; or a seidlitz powder, or a draught of sulphate and carbonate of magnesia, in mint-water, will generally suit when castor-oil cannot be taken. The idiosyncrasy of the patient should be consulted upon this point, and any aperient avoided which is likely to cause gastro-intestinal irritation.

On paying our first visit to a lying-in patient, which should always, if possible, be within twelve hours of her delivery, one of our questions should be with respect to the state of the Bladder. In long and painful labours, especially in primapara, it not unfrequently occurs that the bladder is quite paralysed to the influence of volition, and the patient finds herself unable to pass urine. This paralysis appears to depend on the pressure exerted upon the neck of the bladder by the fœtal head, and to affect the sphincter vesicæ chiefly. This feeble action of the bladder is also increased, and in some cases caused altogether by the opiate administered after delivery. The effects of pressure are probably aided by the influence of the shock of labour upon the lower part of the spinal marrow. The difficulty generally disappears spontaneously after a few days, the bladder recovering its tone and irritability. Sometimes a little urine is passed, but the bladder is unable to empty itself thoroughly. Besides asking the question, it is proper, if there should be any doubt upon the subject, to place the hand upon the hypogastrium, when, if the bladder be distended, its elongated oval outline is readily felt above the pubis. The remedy is of course the use of the catheter for a few days, if necessary. It is of great importance to diagnose this affection, as a distended bladder may be mistaken for other diseases, and the patient put through a course of inapplicable treatment; or the organ may be ruptured, and lead to a fatal result. Convulsions have also been excited by the irritation of vesical distension. The quantity of fœtid ammoniacal urine drawn off in some of these cases is quite astonishing.

It is necessary to say a few words respecting the management of the Infant during the puerperal period.

After delivery, it is expected that the accoucheur should make such an examination of the child as will enable him to say that the infant is perfect and well formed. The state of the genital organs, the hands and feet, and the mouth and oral cavity, should be observed. At our first visit, we should inquire whether the child's bowels have been relieved or not, and whether it has passed urine. The bowels are generally purged by the irritation of the meconium and the effects of cold upon the surface. If the bowels have not been moved, or the evacuations are insufficient, a teaspoonful of castor oil should be given. In cases of retention of urine, the bladder can generally be made to act by sprinkling a little cold water upon the hypogastrium, by applying a hot sponge to the genitals, or by the use of a warm bath. Sometimes the phymosis natural to the male infant is so great as to interfere with the flow of urine, or micturition is always attended by pain. In these cases, relief is obtained by dilating the aperture of the prepuce by a probe. The child is generally kept in the same room as its mother, and the subdued light proper to the lying-in woman is well suited to the delicate eyes of the child.

The management of the Funis is usually very simple. It is wrapped in a piece of singed linen by the nurse, and the projecting portion dies and falls from the umbilicus within a week after delivery. The charred linen appears to have been in use from time immemorial, and to prevent in some degree the smell attending the death of the part. The stump commonly heals spontaneously; and after a time the navel is drawn in by the action of the urachus, and by the remains of the vessels passing from the umbilicus to the liver. Sometimes the site of separation becomes sore, large granulations sprouting from its surface, requiring the application of sulphate of copper, or some other astringent. In some cases these florid growths have required removal by the scissors. Hæmorrhage has in rare instances occurred from the stump of the funis, requiring ice, astringents, and pressure for its relief; and it has happened that children have been lost from this form of bleeding. Traumatic tetanus from the division of the funis is rare in this country, but it is a disease of not infrequent occurrence in hot climates, as the East and West Indies; and it occurs in other localities, as in the Faro Islands, where ventilation and cleanliness are greatly neglected.

A few days after birth, it is very common for the child to be affected with Jaundice. Icterus Infantum arises from the great changes effected in the hepatic circulation, by the establishment of respiration, and the arrest of the current of blood between the funis and the liver. This form of jaundice disappears as the liver becomes accustomed to the conditions of extra-uterine life, and the flow of bile is established. When it does not pass off readily, a dose or two of grey powder and a little castor oil are generally sufficient to cure it.

It is hardly necessary to insist upon the Breast-Milk as the natural food of the infant, yet an enormous number of children die annually, within a few weeks after birth, of marasmus caused by want of breast-milk. The medical attendant should invariably contend for the suckling of the child, or the engagement of a healthy wet-nurse. This should be arranged as early as convenient, as much injury is sometimes done in a short time, to the tender stomach of the child, by attempts at artificial feeding. Pathological inquiries show that the gastric mucous membrane has a tendency to soften under a deprivation of proper nourishment, and this softening is attended by marasmus and fever, ending in death. When artificial feeding is inevitable, the child will have the best chance of life from the use of fluid food only.

Asses' milk, to which a little cream has been added, or cows' milk, diluted at first with an equal quantity of water and sweetened with sugar, the quantity of water being diminished as the child becomes older, form the best infantile nourishment under these circumstances. The milk should always be fresh, and some experienced nurses greatly prefer boiled milk for children.

Many of the matters treated of in the present and the preceding Chapter may be thought to pertain to the nature of "common things;" but attention is not the less necessary to them, if we would conduct patients safely through parturition and the puerperal state in natural cases. It should always be borne in mind, that at any stage of the processes through which the patient passes between the commencement of labour and puerperal convalescence, the most simple case may be converted into one of difficulty and danger.

CHAPTER XXVI.

FACE PRESENTATIONS.

In the preceding chapters the mechanism and management of cases in which the Head presents in its different positions have been treated of. We have now to pass from the consideration of cranial presentations to those of the Face. The transition from vertex to face presentations is easy and natural, because of the identity of the parts concerned. It will be found convenient to direct attention to the following considerations in connexion with presentations of the face—namely, the mechanism, the diagnosis, and the management.

There is a very close analogy between the mechanism of face and vertex presentations. Let the fronto-mental diameter of the fœtal head be substituted for the occipito-frontal at the brim of the pelvis, and the similarity as well as the difference will be readily appreciated. It will be remembered that three kinds of obliquity were spoken of in the passage of the head through the pelvis in vertex cases:—1. An obliquity consisting of the position of the long axis of the fœtal head in one of the oblique diameters of the brim. 2. An obliquity, consisting of a dip of the posterior extremity of this axis in the cavity of the pelvis. 3. An obliquity, consisting of a dip of one or other extremity of the bi-parietal diameter of the cranium in the pelvis. A similar triple bias, or obliquity, obtains in face presentations. Thus the fronto-mental diameter of the face, which represents the occipito-frontal of the head, in vertex cases, is oblique as regards the diameters of the brim, and oblique as regards the superior plane of the pelvis, while there is a dip of the anterior extremity of the bi-temporal diameter of the face, in the pelvis, corresponding to the dip of the bi-parietal diameter of the head in vertex cases. The chief defect in the analogy of face and vertex presentations is, that while in the latter, the posterior extremity of the long diameter of the head is from first to last lowest in the pelvis, in the former there is a change effected, the frontal end of the fronto-mental diameter being lowest at the commencement, and the mental extremity lowest at the end of labour. This defect is, however, more apparent than real, because the face rotates so much in the pelvis as to make the chin represent the occiput in the act of the disengagement of the head. In addition to the parallelism already mentioned, there are certain linear guides to the position of the face which in a manner represent the sutures of the cranium. Thus the mouth may be said to replace the anterior fontanelle at the commencement of labour. The bridge of the nose corresponds to the sagittal suture; and the ridges of the orbits to the coronal or lambdoidal sutures, as the case may be. The grand difference between vertex and face cases is, that in the former the head is flexed—that is to say, the chin is bent down upon the breast, the occipital extremity of the head thus becoming the most advanced or depending portion of the cranium; while in face presentations the head is extended, the chin being separated from the chest as far as possible, and the head thrown back on the nape of the neck. Now, it is obvious that there may be many intermediate positions between extreme flexion and extreme extension; but, as a general rule, one or other of these extremes does actually obtain, and semi-extension is of rare occurrence. When it does exist, Brow presentations are produced, and they are amongst the most difficult of cranial labours. Extension of the head increases as labour advances, so that when the head is in the act of disengagement, the chin is further separated from the breast than at any other period of labour. The manner in which such a decided irregularity as the extension which produces face presentations is brought about, is somewhat obscure; but we are in possession of certain physiological facts and principles which will account, to a certain extent, for a portion of these, as well as of other forms of mal-presentation. Before, however, going on to state these, it is interesting to remark, that *flexion* is the normal condition of the fœtus—every limb, every finger, the trunk, and, in fact, every moveable member is flexed, and the *extension* of the head, in face cases, must, therefore, clearly be the result either of unusual mechanical or vital conditions, intrinsic or extrinsic to the fœtus. The application of the foregoing and following considerations extends, it should be said, not merely to face presentations, but to mal-positions in general. Dr. Fleetwood Churchill and Dr. Simpson arrange the causes of mal-presentations pretty nearly as follows:—

1. Face presentations and mal-positions generally, are the result occasionally of premature labour, in which the moulding influence of the shape and contractions of the immature uterus and the reflex and tonic contraction of the limbs of the fœtus, are not effective.

2. They are the result of death of the fœtus *in utero;* or, in other words, of loss of muscular tone and the adaptive reflex movements, and an alteration of the specific gravity of the fœtal head.

3. They are the consequences of the application of unusual excito-motor stimuli to the fœtus and uterus.

4. They are the result of causes mechanically displacing the whole fœtus, or the presenting part, during pregnancy, or at the commencement of labour, such as a large quantity of liquor amnii, or premature and sudden rupture of the membranes.

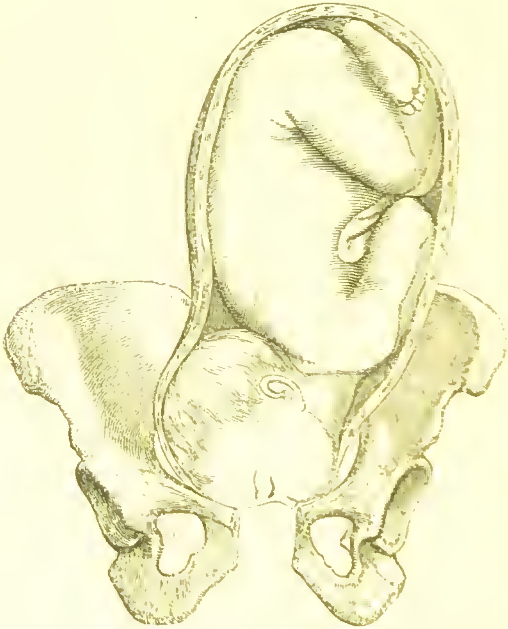
There are four presentations of the face, as of the vertex, and they are similarly numbered. In the first, the forehead is towards the left acetabulum; in the second, towards the right acetabulum; in the third, towards the right sacro-iliac synchondrosis; and in the fourth, towards the left sacro-iliac synchondrosis. These positions are the exact analogues of the four vertex presentations respectively, and may be looked upon as vertex cases in which the head has become accidentally extended. In practice, it will be found that the third and fourth face presentations are so extremely rare as hardly to be worth enumerating, and consequently our attention may be confined to the first and second only. The first is the most frequent, being to the second, according to Naegelé, as twenty-two to seventeen. As regards the frequency of face presentations, Dr. Fleetwood Churchill has collated the proportion in nearly a quarter of a million of cases, and he finds that this mal-presentation occurs once in about $231\frac{2}{3}$ cases.

In the First Facial Position, if the finger be introduced into the os uteri at the commencement of labour, it will impinge upon the bridge of the nose; carrying the finger forwards and to the left, it arrives at the forehead, which is found opposite the left acetabulum; and just beyond the root of the nose the frontal suture may be traced upwards and forwards, widening in its course towards the great fontanelle. This opening can, however, seldom be reached; and, indeed, the farther out of reach it is, the more favourable is the position of the head. Tracing the nose backwards and to the right, the mouth is reached, and the alveolar ridges may be distinguished. Still further backwards, the chin may be found in relation with the right sacro-iliac synchondrosis. The line represented by the bridge of the nose does not, however, cut the os uteri equally, it is more posterior than anterior, and consequently the right side of the face occupies the anterior and greater segment of the mouth of the uterus. The primary caput succedaneum will in this presentation be found upon the upper half of the right side of the face, and will include a surface corresponding to the right eye, malar bone, and adjoining parts. Thus the upper part of the right side of the face is lowest in the pelvis. As labour advances, and the head descends in the pelvis, the head gradually turns, so as to bring the chin forwards from the right sacro-iliac synchondrosis to the right obturator foramen: and in accomplishing this rotation from right to left, the chin is brought lower in the pelvis. The spine of the ischium in face, as in ordinary vertex presentations, is the directing agent, and the chin of the fœtus is the part acted upon in the latter. In the first cranial position, it will be remembered that the left side of the posterior extremity of the head glides down the inclined plane formed by the anterior surface of the left ischial spine, and that the head has thus a rotation imparted to it from left to right. In the facial presentation under consideration, it is the left side of the chin which comes into contact with the anterior surface of the spine of the right ischium, and thus the rotation, although of an exactly similar nature, is in the reversed direction—*i.e.*, from right to left. In both cases, however, the same general statement applies—namely, that the opposing surface of the fœtus is thrown downwards and forwards under the arch of the pubis. As the chin advances and turns forwards, the arch of the cranium is directed backwards towards the hollow of the sacrum, and thus the head is completely lodged in the cavity of the pelvis. The right cheek and angle of the mouth are now the presenting parts, and the chin is just about to emerge from under the arch of the pubis. The next step is emergence of the chin, not exactly in the middle line, but still directed somewhat to the right, as in vertex presentations, where the antero-posterior diameter of the head is never exactly in relation with the antero-posterior diameter of the outlet of the pelvis. By the liberation of the chin, room is gained; and now a process of flexion takes place analogous to the extension of vertex presentations: the chin becomes temporarily almost fixed, and the head rotates upon its transverse axis, so as to bring the vault of the cranium out with a sweep over the perinæum, the occiput being the last part expelled. During the flexion described, there is an advance of the head *en masse*, but it is not so conspicuous as the flexion. If the face remains long in apposition with the os externum, a secondary tumour forms on the cheek; but, instead of being on the upper, it is on the lower half of the face, and involves more of the opposite side of the face than the primary tumour does. This is evidently in consequence of the depression of the chin, and the change from an oblique to an almost antero-posterior position in the long diameter of the face. The head having been expelled, the rest of the body behaves as in first vertex presentations. The right shoulder being lowest in the pelvis, is propelled against the anterior surface of the spine of the right ischium, and rotated from right to left, so as to place the shoulders nearly in the antero-posterior diameter of the outlet of the pelvis. The right shoulder is thus born first, and the left sweeps over the perinæum. The hips are born in the same manner. The following engravings represent the presentation of the face at the brim of the pelvis, at the outlet, and passing through the external parts. (Figs. 115, 116, 117.)

In the Second Facial Position, the details of the mechanism are exactly similar, only that the forehead is directed towards the right acetabulum, and the chin towards the left sacro-iliac synchondrosis, and all the rotations of the first position are exactly reversed. In fact, by using the word "right" for "left," and "left" for "right," the description of the mechanism of a first facial position applies with the utmost precision to the second also.

In the first position of the face, we may, while it passes through the pelvis, compare the situation of the chin to the situation of the vertex in the third position of the head. The same rotation of the part first to emerge through the pelvis, from the right sacro-iliac synchondrosis to the right side of the pubic arch, is usually effected in both. We may also

Fig. 115.

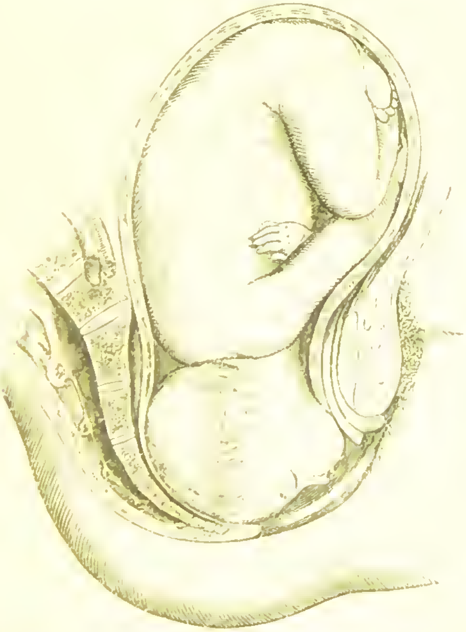


Presentation of the face at the pelvic brim in the second facial position.

compare the second facial position to the ordinary termination of the fourth vertex presentation, the chin in this case rotating from the left sacro-iliac synchondrosis to the left side of the pubic arch. In face cases, the mental protuberance is the thread of the screw which is in contact with the ischial planes, and the rotation amounts to about one-fourth of a circle. As the chin passes out of the pelvis in the first facial position, it is in the same position as the vertex in the second cranial position; while in the second facial position, the chin emerges in the same path as the vertex in the first cranial position.

Certain varieties of face presentations have been described, in one of which the chin has been spoken of as sweeping over the perinæum. Smellie and Hamilton both include such cases in their systematic account of face labour; but with a normal pelvis and fœtal head of the ordinary size, such a mode of termination is utterly impossible without the aid of instruments. There is an intermediate presentation in which the head is neither completely flexed, as in vertex cases, nor completely extended, as in face presentations; this has been already alluded to as constituting brow presentation. On examining these cases at the commencement of labour, the frontal protuberance of the right or left side will be found to be as nearly as possible the

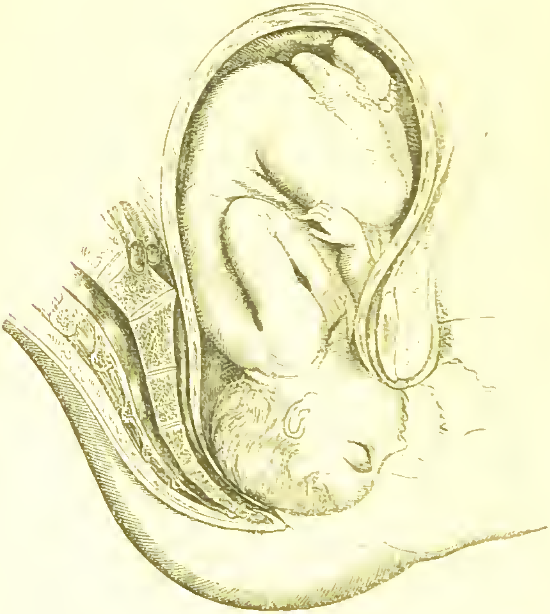
FIG. 116.



Emergence of the head from the pelvis in face presentation.

presenting part. The diameter of the fœtal head which enters the right or left oblique diameter of the pelvis, is that between the chin and the great fontanelle; the chin may be towards the right or left ilium. In the first, the presentation will be the analogue of a first vertex or face case, and the latter of a second vertex or face position. As labour advances, the head sinks down in the pelvis, and the right or left side of the face becomes most anterior and lowest in the pelvis according to whether the case represents the first or second position. The finger now easily arrives at the great fontanelle, which is anterior, and to the left or right, as the case may be, and in the opposite direction the chin may be found. Both the anterior fontanelle and the chin are higher in the cavity of the pelvis than the forehead. Unless the pelvis is very large, or the head of the fœtus very small and yielding, the case now comes to a stand-still, the arch of the cranium

Fig. 117.



Passage of the head through the external parts in face presentation.

being forced down upon the pubis, and the chin hooked against the upper border of the great sacro-sciatic ligaments. These cases require the aid of the forceps, and are difficult to manage, on account of the fact that these instruments can only be applied in this position to the face, over which they do not slip very easily.

The diagnosis of face presentations may be considered to rest upon the absence of certain signs peculiar to other presentations, and upon the recognition of parts actually belonging to the face. The face may be distinguished through the membranes as a very uneven surface, totally dissimilar to the hard, smooth, globular mass of the vertex. If the head is very high, and the membranes tense and tough, it is not so easy to recognise the parts. It is still more difficult to determine the position through the walls of the cervix uteri. In a later stage of labour, continued pressure may so modify the contour of the face, and induce such swelling of the features, as to simulate very much the general aspect of a breech presentation. In this case, the malar bones, with their soft coverings, may be mistaken for the ischia and buttocks, the mouth may be so swollen as to be easily confounded with the anus, or the eyes may be confounded with the vulva of a female child. When no peculiarly untoward circumstances are present to obscure the real nature of the presentation, it is tolerably easy to recognise the frontal suture narrowing towards the root of the nose, the ridge of the nose, the orbits on each side, with their bony circumferences, and, beyond the nose, the large cavity of the mouth and the firm edges of the alveolar processes. If any doubt exists as to whether the face or breech presents, the difficulty may be cleared up in certain cases by an appeal to the surface of the abdomen: thus, in thin women, the parietes of whose abdomens are lax, and in whose uteri there may happen to be but a small quantity of liquor amnii, the head may occasionally be recognised externally as a spheroidal mass at the fundus of the womb, and this, of course, negatives the possibility of a face presentation. On the other hand, the character of the meconium may become diagnostic; for although it may be met with both in pelvic and cephalic presentations, yet in the latter, it is in a diluted state, and is very different from the tenacious meconium of a breech case, which has not been mixed with the amniotic waters.

We now arrive at the management of face presentations.

In former times a great variety of contrivances were in favour amongst obstetricians for facilitating delivery in face cases. The foundation of this love of interference was evidently the strong conviction, which anciently prevailed, of the preternatural nature of the presentation, and this scientific prejudice found its practical development in procedures essentially meddlesome and bad. The first of these unphilosophical procedures was that of turning; it was, of course, only recommended when the head was high in the pelvis and the liquor amnii as yet undischarged. Almost within the present generation, turning has been recommended in face cases, by high authorities. It is now a well ascertained fact, that, putting out of the question the danger accruing to the mother from the operation of turning, the chances of death to the child are more than doubled. The greater control which the accoucheur has over the progress of labour is certainly an attractive feature in the mode of practice; but as very rapid delivery is by no means the great desideratum in obstetries, it is right to relinquish the control for the sake of additional safety. It should never be forgotten, too, that in all cases of version, however skilfully performed, there are certain risks to the mother, arising out of mechanical violence, inflicted either by the operator, or by the uterus upon itself; while shock and irritation, perhaps running on into inflammation, are but too frequently the results of manual interferences, in which no mechanical violence whatever has been applied to the parts. Turning can only be admissible when there is such a complication as necessitates our putting the safety of the child out of the question, and balancing the operation of version against some more violent natural or artificial termination to the labour. Dr. J. Clarke adopted another plan, which was to wait until the head had descended into the cavity of the pelvis, and then to exert steady pressure, in a direction upwards and backwards, upon the presenting cheek during each pain; by this means he averred that he succeeded in lodging the face in the hollow of the sacrum, and that the labour then terminated as in vertex cases. Whatever may have been the results of this practice in the hands of Dr. Clarke, it is obviously attended with considerable risk: in the first place, success is very doubtful, and it is far more probable that a brow presentation will be brought about than that a rectification will be produced; and in the next place, the procedure is a violent one as regards the child. A moment's consideration of the mechanical relations of the parts concerned will show that, as soon as any elevation of the chin is obtained, the arch of the cranium will be brought down upon the pubis; and should the uterus act with any vigour, he will be a dexterous operator who terminates the case without the forceps or some graver procedure still. A more pernicious mode of practice than either of the above was first recommended by Baudelocque, and received the sanction of Lachapelle, as well as some British obstetricians. The operation was founded upon a misconception of the mechanism of labour in face cases of the following nature. It was supposed that whenever the chin was towards the sacro-iliac synchondrosis of either side, the head must necessarily pass out of the pubis with the chin directed posteriorly. Whenever such cases had been actually observed, they had certainly been seen to be attended with great risk to the fœtus and suffering to the mother; but the grand error was that not only are mento-posterior presentations, as a general rule, changed into mento-anterior ones, but that, instead of mento-posterior positions being exceptional and peculiar, they are the most frequent of face presentations. The fact that the chin was generally towards one or other sacro-iliac synchondrosis was not known, and the rotation of the chin forwards in nearly all cases, was equally undiscovered. It was thought that an original anterior position of the chin was the only favourable position in face cases, and, knowing what we now do as to the infrequency of this presentation, it can hardly be a matter of surprise to us that such frequent manual interference was resorted to, and that such an unfavourable prognostic was applied to face presentations in general. The operation in question was to be performed in the early stage of labour, before the membranes were ruptured. It was recommended to introduce the hand into the vagina, through the os uteri, and into the space between the brim of the pelvis and the forehead of the fœtus; the palmar surface of the fingers being kept towards the head of the child. The next step was to rupture the membranes and hook the fingers over the arch of the head, and, if possible, drag down the occiput,—indeed, this was the object of the procedure,—and thus convert the face presentation into an ordinary vertex one. The objections to this method are numerous. Since Naegelé wrote his celebrated treatise on the mechanism of labour it has been generally known that not only is the chin at first generally directed backwards, but that, in nearly all cases, it turns forwards under the arch of the pubis as a necessary result of normal relations between the pelvis, the fœtal head, and the expulsive powers. Having thus eliminated a large proportion of cases from the category of those requiring artificial assistance, let us inquire, What are the dangers of Baudelocque's operation? It must be granted that the introduction of the whole hand at the commencement of labour, before the external organs of generation are dilated and softened, must be an extremely painful procedure for the mother, and the efforts used for the introduction of the hand into the uterus can hardly fail not only to be painful, but to give rise to serious accidents. Moreau saw a case in which rupture of the uterus, followed by immediate death, was the result of this operation, and the circumstance is the more worthy of notice, because the operator was a person well used to obstetric manipulations.

In the next place, the sudden escape of the liquor amnii before the head has become engaged in the superior strait of the pelvis is very likely to result in descent of the funis, a circumstance which places the fœtus in great peril. Again, an arm may descend, or even two may come down, and create additional difficulty in the further progress of the case; and, finally, it is an inseparable result of these tentative efforts, that when they fail to produce a vertex presentation, recourse must be had to the forceps or pelvic version. It may be added, that the early evacuation of the liquor amnii is a circumstance extremely objectionable in itself, as subjecting the fœtus to the immediate pressure of the uterine walls, and abrogating all those arrangements which conduce to easy delivery in a spontaneous vertex presentation. If the operation were easy and inoffensive, and if it placed both mother and fœtus, after its accomplishment (always supposing it to have been accomplished), in the same condition which would have obtained in a spontaneous vertex position; if, in a word, the least analogy existed between a labour where the vertex presents spontaneously and one in which it had been dragged down, it would be proper to resort to Baudelocque's method; but inasmuch as failure is probable, the condition produced not identical, the danger to mother and child from the operation itself not small, and the alternative after failure another and still graver operation, the whole proceeding is totally inadmissible.

In actual practice, it will be found that the treatment of face cases is extremely simple. We may assist the chin in making its rotation forwards and downwards, by introducing the finger into the child's mouth, making traction upon the lower jaw, and bringing it under the arch of the pubis. Meigs lays it down as the great rule of practice in face cases, that the chin should be brought towards the pubis as the face emerges from the pelvis. This is an analogous procedure to that of bringing the occiput down in vertex cases, either directly, by the fingers applied to the back of the head, or indirectly, by pressure exerted upon the forehead. The principle is the same in both cases—viz., to favour the birth of that part which tends to be born first. Should the head fail to rotate in the pelvis, the forceps will generally be necessary, or the head must be dislodged, and the child delivered by turning. Where delay arises, not from faulty position, but from disproportion in bulk between the head of the fœtus and the pelvis of the mother, or from inadequate uterine contraction, the same rules of treatment apply as in cases of impactment or inertia uteri, where the vertex presents, with this modification, that as the parts engaged in the pelvis are more solid, less advantage will be gained by delay in so far as moulding of the head is concerned, and more danger will accrue to the mother from pressure upon the rectum and bladder. The fœtus itself is more endangered, too, by long engagement in the pelvis, in face than in vertex positions, the vessels of the neck being often injuriously pressed upon. During the progress of a face case, care should be taken to keep the pelvic viscera empty, and to preserve the membranes entire as long as possible. In making examinations, the delicate structure of the organs within reach should be remembered, as cases not unfrequently happen in which the eyes have been seriously injured by careless manipulations. Examinations should not be more frequent than necessary to determine the exact presentation at first, and the subsequent rate of progress. The perinæum should be carefully guarded, but not pressed upon. After birth, the features of the child will generally be found hideously distorted, the mouth dragged to one side, and one or both eyes occluded. Fomentation with warm water, decoction of poppy-heads or marsh-mallow, will be all that is necessary, as the parts will gradually return to their normal condition.

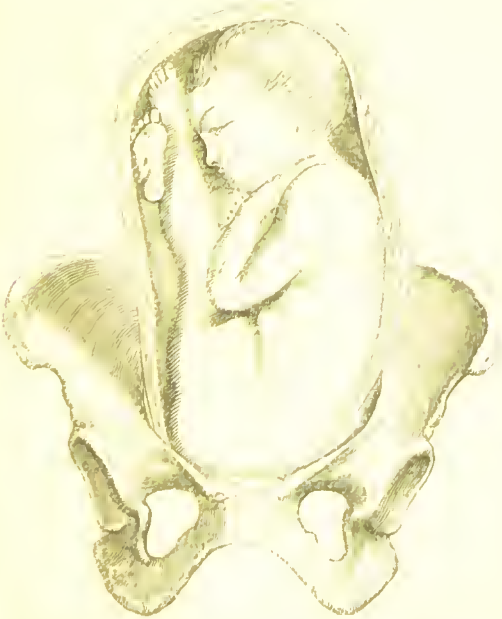
CHAPTER XXVII.

PELVIC PRESENTATIONS.

Having considered those presentations in which the Cephalic extremity of the fœtus is situated inferiorly, we may now pass to those in which the Pelvic extremity of the child holds the same position. It has been a matter of controversy whether pelvic presentations should be considered natural or preternatural. Whatever arguments have been urged on either side, it may be said that the same detriment has not accrued to practice as from erroneous theoretical opinions with regard to the nature of face presentations, inasmuch as all have been agreed pretty nearly as to the time and manner of rendering assistance in pelvic cases. Practical conclusions not having been deduced from the one or other view of the question, all interest in it vanishes, and we are left free to consider only that which is useful. It is by no means necessary to enter into detailed separate descriptions of the various forms of pelvic presentation; they are, in reality, but trifling varieties of the same order of labours, and differ very little except in some particulars of management; their mechanism is essentially the same, and the fundamental rules of treatment which apply to the one variety apply with equal force to the other. We may look upon the pelvic extremity of the fœtus as composed of certain elements, which may present alone, or in certain combinations. The most complete variety is where the breech engages itself in the pelvis first: then the knees may present, or the feet, or a single foot or knee. A needless subdivision of breech presentations has been made by some authors, and the pelvis of the fœtus has been described as occupying almost every conceivable position at the brim of the maternal pelvis. The complexity thus given to the subject of the mechanism of pelvic labours was, however, first cleared away by the same careful observer to whom we are indebted for nearly all that we know, exactly, of the intra-pelvic movements of the fœtus. Naegelé reduced all pelvic presentations into two orders; in the first, the back of the child is towards the abdomen of the mother; in the second, the abdomen of the child is towards the mother's abdomen. These may be called respectively, the dorso-anterior and the abdomino-anterior positions. In neither case, however, is the back of the fœtus situated quite anteriorly or posteriorly, but rather obliquely, so that one hip is more anterior than another. The dorso-anterior position is, according to the same authority, more frequent than the reverse presentation, in the proportion of three to one. Let us now examine the mechanism of pelvic labours, first premising that they ensue according to fixed laws, as cranial labours do, with only this difference, that deviations from the usual course are perhaps rather more frequent, and attended with less risk than when the head presents.

In dorso-anterior pelvic presentations, the relation of the fœtus to the maternal pelvis is, generally speaking, as follows :—The transverse diameter of the child's hips occupies the left oblique diameter of the pelvis, its sacrum is directed towards the left acetabulum, its left trochanter towards the right acetabulum, and its right trochanter towards the left sacro-iliac synchondrosis. (Fig. 118.) Upon examining as

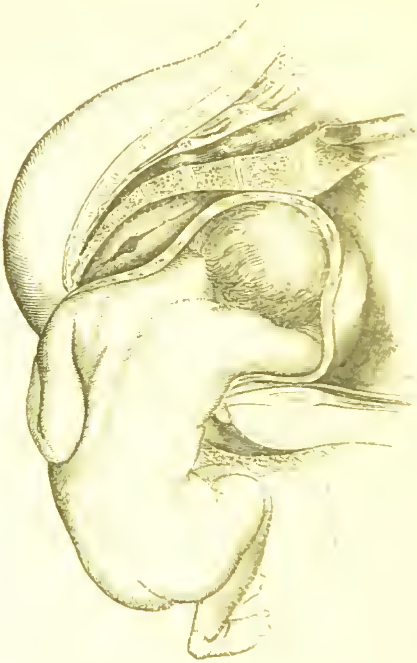
FIG. 118.



Pelvic presentation in the first dorso-anterior position.

the breech is entering the superior strait of the pelvis, it will be found that the os uteri is occupied by a double tumour, soft but elastic; during the intermission of a pain, the several parts to which reference will be made when speaking of the diagnosis, may be readily distinguished, and it will be found that the sulcus between each segment of the tumour is oblique, and situated more posteriorly than anteriorly; or, in other words, one buttock, the left, occupies the anterior and greater half of the mouth of the uterus. It will be observed, also, that this buttock, which is most anterior, is also the lowest in the pelvis, and is, in fact, the presenting part. As labour advances, and the hips descend, the left hip is still lowest in the pelvis, and steadily directed somewhat to the right side; what now takes place is a matter of dispute. The great majority of obstetricians contend that a rotation analogous to the rotation of cranial labours takes place, that the left hip turns more and more forwards, until it comes to be nearly under the pubic arch, and that the hips and shoulders thus emerge from the pelvis, nearly in the antero-posterior diameter of its outlet. This statement is made confidently by observers of great and deserved repute, but M. Naegelé, nevertheless, flatly contradicts it, and makes it the subject of some pleasantry: his words are nearly as follows:—"In its farther advance (the breech) into the pelvis, it is always found in an oblique direction, the hip directed forwards standing lowest. In this oblique position, with reference to its transverse and perpendicular diameters, it is forced through the inlet, the cavity, and the outlet of the pelvis: and in general none of those rotations occur, erroneously described in many manuals and compendia as appertaining to this species of labours. There are some, certainly, who, compass and skull in hand, measure the diameters of the bony pelvis, and then on the writing-desk so turn and extract a manikin, that the transverse diameter of the hips always passes in that direction, which, according to calculation on the bony pelvis, they account the largest." The truth, as usual, would appear to lie between the contending parties. That there is a slight rotation can hardly be doubted, but it is not so constant nor so well marked as the rotation of the cranium. There is not the same difference between the diameters of the breech of the fœtus as between the diameters of its head, and consequently there is not the same necessity for a movement of adaptation; we shall find that the head, however, obeys the same mechanical necessities in its exit, in pelvic labours, as when it presents at first. Supposing the breech to have become entirely engaged in the cavity of the pelvis, the left hip will be found just within the vulva, and the right hip beginning to press down on the floor of the pelvis posteriorly, and somewhat to the left side. The left hip then becomes nearly fixed under the pubic arch, and a movement of flexion takes place analogous to the flexion of face and the extension of vertex labours; the right hip sweeps over the perinæum, the pelvis of the fœtus rotating, as it were, upon its antero-posterior diameter. As soon as the right hip has escaped from the tight embrace of the perinæum, a movement onwards *en masse* takes place, the feet usually slip out, and presently the knees become disengaged; and the inferior half of the child's body is thus born. The abdomen of the fœtus is now turned towards the inner side of the right thigh, or, supposing the woman to be in the ordinary obstetric position, upwards. The rest of the body follows in the same manner, the shoulders entering the left and oblique diameter of the inlet. The manner in which the arms are born depends upon whether they remain folded upon the chest of the fœtus, or are displaced during the progress of labour. In the first instance they slip out as the thorax is expelled; in the latter, they are extended upwards on each side of the head, or one may even become locked behind the head, and between it and the pubis; and serious inconvenience may arise from such an accident. If the arms remain extended by the side of the head as the latter passes through the pelvis, the difficulty of the case is of course enhanced. The left shoulder of the fœtus, like the first hip, becomes first engaged in the outlet of the pelvis, and the right shoulder distends and sweeps over the perinæum. (Fig. 119.) During the progress of labour, the fœtal head in most cases remains flexed upon the chest. As the shoulders are about to emerge, the head enters the opposite oblique diameter of the pelvis to that which the hips and shoulders have occupied; thus the forehead is towards the right sacro-iliac synchondrosis, and the occiput is directed towards the left acetabulum. The occipito-frontal diameter of the fœtal head is not, however, exactly that which comes into relation with the right oblique diameter of the pelvis, for the chin is depressed and the occiput is the highest point of the fœtus; it is the sub-occipito-frontal diameter which presents, and thus sufficient room is gained to allow the head to become easily engaged in the cavity of the pelvis, and to permit the face to be rotated into the hollow of the sacrum. The under

FIG. 119.

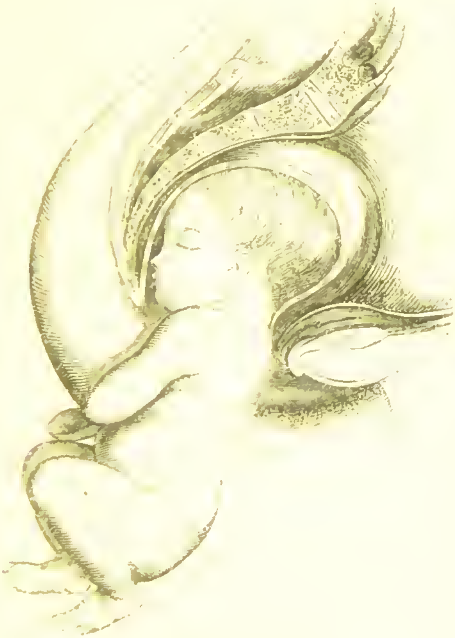


Passage of the shoulders, and partial rotation of the thorax.

surface of the occiput now rests against the inner surface of the symphysis pubis, the mass of the face occupies the sacral concavity, and the chin may be felt some little way within the perinæum. In the further expulsion of the head the occiput is almost a fixed point, and the head rotates upon its transverse axis in such a manner that first the chin sweeps over the perinæum, then the face, the forehead, and the arch of the cranium; and finally, the bulkiest part of the head having been expelled, the rest is pushed out by the elasticity of the perinæum and the contraction of the vagina. (Fig. 120.)

In the second variety of dorso-anterior positions, the hips of the child occupy the right oblique diameter of the brim of the pelvis; the right buttock presents, if it is a breech case, and occupies the greater and anterior segment of the os uteri; and the left buttock sweeps the perinæum. The right side of the fœtus is directed steadily somewhat to the left acetabulum,

FIG. 120.



Descent of the head.

and its abdomen turns downwards, or towards the left thigh of the mother. The head enters the left oblique diameter of the pelvic inlet, the forehead being towards the left sacro-iliac synchondrosis; the face turns into the hollow of the sacrum, as in the first instance, and the whole progress of the case is in fact the converse of what happens in the first position; just as the second is the converse of the first vertex or face presentation.

Abdomino-anterior positions of the fœtus, with the breech or lower extremities presenting, are of two kinds. In the first and most frequent variety, the hips of the child occupy the right oblique diameter of the inlet, the left trochanter is towards the left acetabulum of the mother, the left hip presents and stands lowest in the pelvis from first to last, and the whole body as far as the shoulders is expelled, looking forwards and to the right. The head enters the left oblique diameter of the inlet of the pelvis, the occiput being towards the left sacro-iliac synchondrosis. As the head descends in the pelvis, the occiput rotates forwards from left to right until at last the face is lodged in the hollow of the sacrum, just as it rotates in fourth vertex positions. Those parts of the fœtus which were already born may now be seen to rotate in a corresponding direction and degree to the intra-pelvic rotation of the head; thus the anterior surface of the child's body, which at first looked forwards and to the right, now looks backwards and to the right, and the case then terminates exactly as the first sub-order of dorsal anterior positions.

The second variety of abdominal anterior positions is where the hips of the fœtus lie in the left oblique diameter of the inlet, the right trochanter being towards the right acetabulum. The right buttock is here the presenting part, and stands lowest in the pelvis. The head enters in the right oblique diameter of the inlet, with the occiput towards the right sacro-iliac synchondrosis, and undergoes the same kind of rotation as the preceding variety—that is to say, the occiput turns forwards and from right to left, and the face is thus thrown into the concavity of the sacrum. The anterior surface of the child's body, which was at first turned forwards and to the left, is at the same time rotated so as to look backwards and to the left. The mechanism of this variety is in fact the exact converse of the preceding.

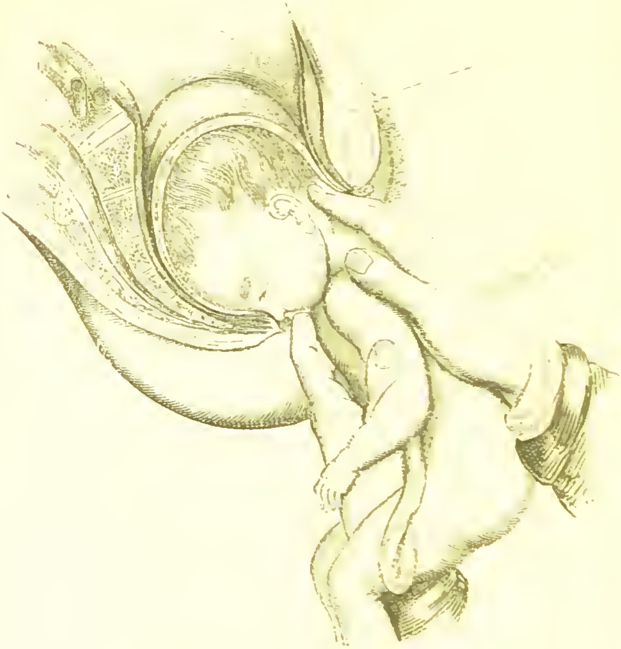
There remain two anomalies in the mechanism of pelvic labours, which are very interesting: one of these relates to an unusual termination of cases in which the abdomen of the infant is anterior; and the other relates to the position and rotation of the fœtal head. It sometimes happens, says Naegelé, in abdominal positions where the fœtus is premature, small, or a twin, that the abdomen, which was at first directed forwards and to the left, or forwards and to the right, is suddenly, and during a single pain, turned so completely round that the abdomen looks backwards and to the right, or backwards and to the left. It is difficult to account for such a singular revolution of the fœtal body. The other anomaly alluded to is where the head, instead of being flexed upon the chest, is extended, the occiput being pressed down upon the nape of the neck. In such cases the vertex rotates backwards into the hollow of the sacrum, the under surface of the lower jaw is brought into relation with the symphysis pubis, and the head emerges in such a manner that, first, the occipital protuberance sweeps over the perinæum, then the arch of the cranium, and then the forehead and face. The foregoing account of the mechanism of pelvic labours applies in every essential particular to each variety. There are, however, one or two subsidiary differences depending upon whether the nates, knees, or feet present. When the breech presents, the birth of the body is slower, but the head follows more readily; when the knees descend, they sometimes create delay by becoming fixed against some point of the bony pelvis, more especially against the lower part of the sacrum; and when the feet present, the birth of the lower half of the body is comparatively rapid, while delay ensues in the passage of the shoulders and head. In labours where the breech or knees present, reliance may be placed upon the position of the presenting part, as an index of the actual position of the fœtus; but when the feet present, it must be borne in mind that they are very mobile, and only assume a determinate position when the nates enter the brim of the pelvis. In some cases of pelvic presentation, it has been remarked by Drs. Hardy and M'Clintock, that the anterior-superior spinous process of the ilium presents, in the first instance, and may cause some confusion.

The diagnosis of pelvic presentations rests upon signs some of which are common to each variety, while there are particular signs by which each special presentation may be determined. The first thing to which the attention is directed in pelvic presentations is the absence of those familiar conditions which obtain when the head of the fœtus is at the brim of the pelvis; and, failing to recognise these, the accoucheur naturally looks for data upon which to found a positive diagnosis in lieu of his negative one. Popular opinion, amongst females at least, attaches much importance to the external configuration of the abdomen, and hence the slightest deviation from the usual form or size excites in women strong apprehensions of mal-position of the child. As long, however, as the long axis of the ovoid mass formed by the fœtus corresponds to the long axis of the uterine cavity, it will make but little difference in the external appearances whether the cephalic or pelvic extremity of the fœtus is directed downwards. Even in transverse presentations it is often surprising how little the figure is affected by the position of the contained infant, and to expect therefore any guidance in the minute difference in form and size between the upper and lower extremity of the fœtus is chimerical in the extreme; it is only in very exceptional cases that an external examination throws any light upon the subject, and even then it is not from the general appearance we judge, but because we can occasionally, with care, under favourable circumstances, recognise the rounded mass of the fœtal head, through the walls of the abdomen, lying at the fundus uteri. It has been said that when the breech presents, the lower end of the utero-fœtal tumour sinks further down into the pelvis at the commencement of labour than when the head presents, and this has been said to occur whether the case is a primiparous one or not. The fact, however, if it be one, will not assist us very materially; for the depth to which the presenting part sinks in the pelvis, independently of uterine contraction, is principally the result of circumstances unconnected with the fœtus, such as the size of the pelvis and the tension of the abdominal walls. In knee and footling cases, the presentation is certainly further out of reach at the commencement of labour than when the head is at the brim of the pelvis, and indeed it not unfrequently happens in footling cases that it is extremely difficult to find any presentation at all, unless the whole hand is introduced into the vagina. The form of the bag of membranes is a point better worth attention; it will be found not to have that rounded form which obtains under ordinary circumstances, and it projects more into the vagina. In footling cases the bag is quite long, and shaped like the finger of a glove, and in all pelvic presentations it is not so tense as when the head presents. Another circumstance worth attending to is the mobility of the presenting part, which in pelvic presentations is generally more resilient, and bounds up in the waters of the amnion more readily than the head does. The sensations of the mother have also been spoken of as furnishing an indication of the position of the fœtus, not to be neglected. In vertex presentations, the feet of the infant are of course directed towards the fundus uteri, and the sensations of struggling felt by the mother are generally referred to the upper portion of the uterus, and more especially to where it is in contact with the abdominal parieties. When the pelvic extremity of the fœtus is its depending portion, these sensations are said to be in a great measure absent, or if perceived, to be referred to a much lower situation. Little reliance can be placed upon auscultation alone in determining pelvic presentations. The fœtal heart beats so nearly midway between the one extremity of its body and the other, that but little alteration in the distance from the pubis, at which it is best heard, is effected, whether the cranial or pelvic extremity of the fœtus depends. When it is remembered that considerable variation in this respect obtains in cranial presentations, it must be conceded that, however useful auscultation may be in other circumstances, we can expect but little assistance from it here. In the first dorsal anterior position, the fœtal heart may be heard loudest a little to the right of the mesial line, and somewhat below the level of the umbilicus; in other positions the sounds of the heart are somewhat obscure, and, in short, auscultation is not to be implicitly relied upon. The manner in which the liquor amnii is discharged is peculiar, though not so characteristic in breech as in knee and footling cases. When the head presents, the membranes rupture, and a sudden gush of water follows, which as suddenly stops; this is because the head is forced down upon the os uteri, and acts as a ball-valve. In pelvic presentations, the gush is not so sudden, and the waters of the amnion continue to flow until the uterus is emptied of all its contained fluid. As might be naturally expected, the character of the pains alters as soon as the membranes have burst, and from this time until the whole body is expelled, and nothing remains but the head in the cavity of the pelvis, the uterine contractions are more clonic, continuous, and closer together than in cranial labours; the absence of fluid from the uterus multiplies the points of contact between the fœtus and uterus, and increased excitation results in increased motor action. But the chief and conclusive evidence of pelvic presentation is the recognition of the individual parts which offer themselves to the touch per vaginam. In breech cases, very little can be accurately distinguished before the membranes are ruptured, beyond the moveable coccyx and the rugosities of the sacrum; these can generally be felt behind one or other acetabulum. As soon as the liquor amnii has escaped, however, the finger of the accoucheur comes into direct contact with the parts of the fœtus. The os uteri will be found occupied by two smooth elastic tumours, divided by a cleft, which extends in one direction towards the coccyx and sacrum, and in the other is continuous as far as the finger can reach. In the track of this cleft, the anus may be distinguished; it differs from the mouth in being smaller, in not containing alveoli and a tongue, and in contracting upon the finger if any attempt is made at introduction. In dead fœtuses, the anus is relaxed, but the distinction may be easily made by reference to the other differences. The vulva of a female child may be distinguished from the mouth in the same manner. Further from the coccyx than the anus, the genitals may be recognised; and in the case of a male child, the scrotum, which commonly hangs down much tumefied, is a very distinctive feature. The meconium which comes away upon the finger in breech cases is tenacious and adhesive. If the breech remains long in the passages, considerable tumefaction takes place, and the diagnosis is to a certain extent obscured; but prolonged and careful examination will generally suffice to overcome this difficulty. The knee may be recognised by its presenting for examination two rounded tuberosities, with a depression between them and the flexure of the leg and thigh, which can easily be reached. The knee is liable to be confounded with the heel, the elbow, and the shoulder; it differs from the heel in having *two* tuberosities; from the elbow in having a *depression*, instead of the sharp point of the olecranon, between its tuberosities; and from the shoulder in having *two* tuberosities in the place of *one*, from which the bony ridges of the clavicle and scapular spine may be traced. The foot is liable to be mistaken for the hand, but it may be identified by the following peculiarities:—In the first place, the line of the toes is regular and even, while the fingers are of various lengths, and form an irregular line. The great toe lies close to the other toes; the thumb, on the contrary, divaricates, and is opposed to the other digits. The foot is thicker than the hand, and its inner border is much rounder than its outer border. The rounded instep of the foot has no analogue in the hand. The heel projects in the opposite direction to the toes. The foot is at a certain angle with the leg, while the hand is continuous in the same direction with the arm; and finally, the foot is weightier, and not so mobile as the hand. In breech cases, it is easy to determine the exact position of the fœtus, and there is no great difficulty in doing so when the knee presents; but in footling cases it is not so easy. If only one foot comes down, it is as well not to be positive until the hips enter the brim of the pelvis; but if both descend, and cross each other, the anterior surface of the body must be in the direction of the toes. When one foot comes down, it should always be identified as right or left.

Having fully satisfied ourselves of the exact position of the fœtus, we have little to do until towards the conclusion of labour. The accoucheur should be an observant spectator of the operations of Nature, thoroughly cognizant of what those operations are, and capable of appreciating at once the slightest departure from their normal course. The first care should be, not to rupture the membranes. In knee and footling cases this caution is even more necessary than when the breech presents. The bag of membranes is required to the last moment, as a dilating agent; no part of the fœtus in pelvic presentations will dilate the passages so equably or so efficiently as the waters of the amnion. A solid body, not possessed of the globular form of the cranium, will exercise pressure in certain directions, according to its specific form; water presses equally in every direction, and water therefore we should endeavour to retain within the membranes as long as possible. This is a cardinal point in the management of pelvic labours. Ancient practice in this particular was very different from modern, and opposed so obviously even to *à priori* considerations, that it is difficult to conceive the necessity of the hard teachings of experience to show its defects. Dr. William Hunter at one time used to convert all breech cases into footling ones; subsequently he was less disposed to interfere with Nature, and he then found his proportion of deaths in pelvic labours very much diminished. Smellie's advice sounds somewhat singular in modern ears; he says, "If the knees or the feet of the child present to the os internum, which is not yet sufficiently dilated to let them and the body come down, let the operator introduce his hand into the vagina, push up and stretch the os uteri, and bring along the feet." Supposing the membranes to be ruptured, the best rule is to let Nature take its own course until the body is born as far as the umbilicus; only guarding the perinæum and relieving it of tension by favouring the flexion of the trunk. The less we interfere, the less rapid will the descent of the fœtus be; and it is very important to secure, if possible, a slow passage of the pelvis and trunk, and consequent complete dilatation of the passages. If the knees descend and accidentally get locked in the cavity of the pelvis, they must of course be liberated; but this is an accident, and not the usual course of events. The *laissez-faire* system does not apply, of course, to cases of inertia uteri; if the breech or hips of the child do not advance, from defect of uterine contraction, either the uterus must be excited, or traction must be made upon the fœtus. Various methods of applying tractile force have been adopted; the finger may be hooked in the groin, or a silk handkerchief passed round the flexure of each thigh, or the blunt hook may be used. A dexterous obstetrician will generally succeed with the unaided hand, and, indeed, the blunt hook is an unnecessarily formidable instrument for such purposes; it bruises soft parts, and is very likely to fracture the thighs of the fœtus. When the umbilicus clears the perinæum, the dangerous part of the labour begins: an abnormal element—viz., compression of the funis—is introduced into a process otherwise normal; and now our art must be exercised and imposed between the fœtus and impending death. The first interference necessary is to draw down a loop of the cord; this is done with a view to obviating any compression which may arise from straightening out of the spirally-coiled umbilical vessels, in the further descent of the trunk. An effort should then be made to draw the cord into one of the recesses on either side of the promontory of the sacrum, as this position is one in which there is less risk of pressure than in any other. The strength of the funicular pulsations should now be narrowly watched, as it bears a direct ratio to the chances of live birth: as long as the cord beats steadily, no interference is necessary, and indeed should be avoided. It is very tempting to see the legs dangling out ready to be grasped, and to know that the fœtus may be seized and dragged forth without much delay, and the bystanders will generally applaud the zeal of the accoucheur who endeavours to hasten the birth under these circumstances; but it sometimes happens that premature efforts at traction dislodge the arms from their position on the child's breast, and throw them up on each side of, or even behind, the head; and it again results, at other times, that the head becomes extended, that the arch of the cranium is rotated into the hollow of the sacrum, and that the child is lost from consequent delay in the passage of the head. Until there is a valid reason, then, for interference, arising out of the condition of the fœtus or the mother, nothing should be done. As the chest is being forced out, it is necessary to be observant of the position of the arms; if they are in their natural position they will slip out of themselves, but if they are extended on each side of the head it will be proper to bring them down. It is best to bring down the arm nearest the perinæum first, as there is more room for manipulation in that direction. One or two fingers should be hooked round the humerus, near the elbow-joint, and the arm should then be drawn gently over the face and chest, not dragged directly downwards. Inattention to this precaution may procure the disagreeable accident of fracture of the humerus. This is not a very uncommon accident in midwife's midwifery, and, indeed, it was of old a rule of practice amongst them to break the arms, as an expeditious and simple method of meeting this difficulty of pelvic labours. The other arm should be dealt with in the same manner. As the shoulders are born, the perinæum again requires care, and as soon as they are liberated, the face will generally rotate into the hollow of the sacrum. The largest and most unyielding part of the fœtus has now to be expelled, at a great mechanical disadvantage. The uterus is so far empty as to have lost much of its power over what remains behind, and the birth of the head is, in fact, principally effected by the diaphragm, abdominal muscles, and muscular structures within the pelvis. Danger accrues to the fœtus more than ever now, from pressure on the cord; and the placenta is so jammed down upon the head of the child as in a great measure to destroy its function as a respiratory organ. This is the stage of labour in which life is generally lost, in which the natural powers avail least, and in which the intervention of art is therefore most needed. It is necessary still, however, to be guided by the actual condition of the child; if the cord beats steadily, it is better to wait for a time than to interfere hurriedly. The signs of danger to the child are failing of the umbilical pulse, and the occurrence of occasional gasping respiratory movements. Whenever it happens that once or twice in the course of a minute inspiratory movements of the muscles of the chest and abdomen are observed, the head of the child remaining as yet in the pelvis, we may be sure that the child is dying of asphyxia. These movements are caused, as already mentioned, by the carbonated blood of the fœtus, in cases of pressure upon the placenta or funis. No other sign of danger to the fœtus is so trustworthy as the occurrence of these jerking spasmodic attempts at respiration.

The necessity of interference being clear, there is no great difficulty in rendering it. A finger or two of the left hand should be introduced into the child's mouth, or laid one on

FIG. 121.



Manual extraction of the head.

each superior maxilla, and the face should be drawn steadily down towards the fourchette of the perinæum: at the same time, the occiput should be pushed up by a finger or two of the right hand, introduced behind the pubis. (Fig. 121). This manœuvre will bring the shortest possible diameter of the fœtal head into relation with the antero-posterior diameter of the outlet of the pelvis. The head will emerge now, with the aid of gentle traction, towards the knees of the mother, and the birth is complete. Whether the position of the fœtus is a dorso-anterior one or an abdomino-anterior, the management varies hardly at all. The occiput rotates forwards from its posterior position just as in third and fourth vertex cases; and Nature will generally adapt the head to the pelvis much better than the accoucheur. No force should be used in the extraction of the head. Above all, traction should never be exerted upon the shoulders, as very slight extension of the neck is sufficient to destroy the child. The stretching of the upper part of the spinal marrow is very dangerous to the life of the infant. Where the head in breech cases is impacted at the outlet of the pelvis, it is sometimes possible to pass up two fingers to the mouth of the child, and to admit a sufficient quantity of air to allow of respiration before the delivery of the head. This was first recommended by Pugh, and Dr. Bigelow, acting upon the same principle, recommends the use of a flat flexible tube for the same purpose. The forceps should always be had in readiness in breech and footling cases. When the head cannot be delivered, or respiration set up by the processes described, and when the danger to the child is imminent, the Forceps should invariably be used. A delay of a minute or even a few moments may sacrifice the life of the fœtus. The forceps is still more likely to be required in footling than in breech cases. When the child is dead or premature, particularly in the former case, less precaution is of course necessary in extracting the head.

Delay and difficulty may occur at various stages in the progress of pelvic labours; thus, there may be ascites, or accumulation of urine in the fœtal bladder; or the child may be tympanitic; or there may be hydrothorax, or hydrocephalus. Any of these accidents may render evisceration necessary. Anchylosis of the coccyx with the sacrum, or a flat or too incurvated condition of the latter bone, may also prove a serious source of delay and danger to the fœtus. Sometimes the os uteri seizes the neck or head of the child, and retards delivery. It is proper, in cases where the breech or lower extremities present, to be prepared with the necessary means of restoring suspended animation. A supply of hot water for baths, and a gum-elastic catheter for inflating the lungs, should be at hand. If there is much cerebral congestion, it will be advisable to allow one or two drachms of blood to escape from the funis. Friction of the surface of the body, aspersion with cold water, and galvanism, may be had recourse to with benefit.

It is always interesting to note the influence of mal-presentations upon the life and subsequent condition of the mother and fœtus. As far as the mother is concerned, it can hardly be said that there is any appreciable difference in the risk of cephalic and pelvic labours. Non-expulsion of the head is the circumstance most likely to prove detrimental to the mother; and bruising of the parts within the pelvis from impactment, or the supervention of inertia uteri followed by flooding, are the forms of danger to which she is exposed. The danger which accrues to the child is, however, very considerable. In breech cases the deaths are as 1 to 3⅕, and in footling cases as 1 to 2½. The gross proportion of deaths in all presentations of the pelvic extremity of the fœtus is about 1 in 3. Death takes place from asphyxia, either produced by compression of the cord or of the placenta, or from early detachment of the placenta, or coma is produced by obstruction of the veins of the neck, and, lastly, the infant may perish from shock or exhaustion. Instrumental interference is based, of course, upon the same general principles which apply to other forms of parturition; but it is of especial importance in breech cases to note by the stethoscope the condition of the fœtal heart. Spontaneous pelvic presentations are less dangerous both to mother and child than the artificial pelvic presentation procured by the operation of version. According to Dr. Fleetwood Churchill's collection of nearly 200,000 cases, the breech presented in the proportion of about 1 in 59½; footling or knee presentations were about 1 in 105 cases.

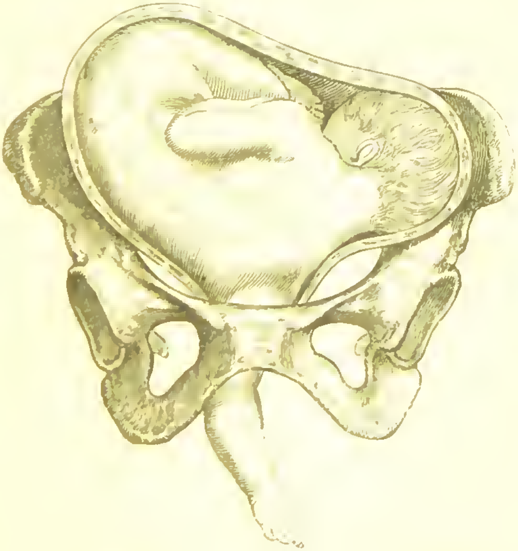
CHAPTER XXVIII.

TRANSVERSE PRESENTATIONS.

In the preceding Chapters we have considered those presentations in which the cephalic or pelvic extremities of the fœtal ovoid are found at the os uteri. We have now to treat of those presentations in which the long diameter of the fœtus is opposed to the short or transverse diameter of the uterus. These cases are termed Transverse or Cross births, and include the presentation of the shoulder or some other part of the superior extremity, and the presentation of any part of the dorsal or abdominal surfaces of the child. The most important, and at the same time the most frequent, are those in which the shoulder, elbow, or hand presents, all of which are spoken of as arm presentations. To these cases we may chiefly direct our attention, as the cases in which some portion of the trunk presents are treated according to the same principles as arm cases.

In arm presentations, two principal positions are recognised, depending on the relations which exist between the abdomen and dorsum of the fœtus, and the back and abdomen of the mother. In the majority of transverse births, the back of the child is towards the abdomen of the mother; in a small proportion, the back of the fœtus is towards the maternal spine. These may be termed the Dorso-anterior, and Abdomino-anterior positions. (Figs. 122 and 123.) They occur in the proportion of two of the former to one of the latter. Besides the abdomino-anterior and abdomino-posterior positions, there are four subsidiary varieties in the position of the child in arm cases, depending on the situation of the fœtal head on

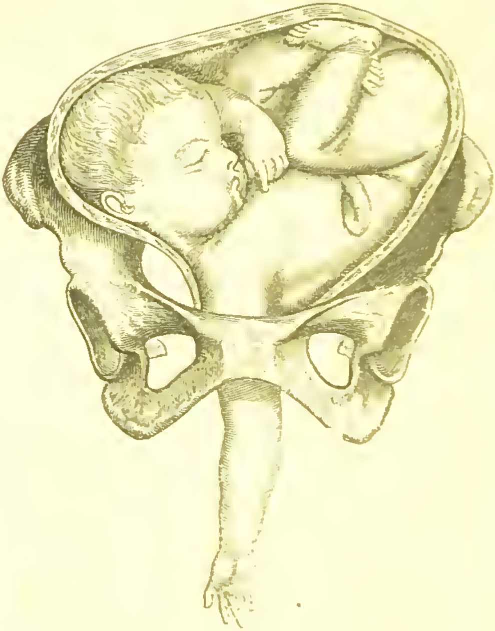
Fig. 122.



Arm presentation in the dorso-anterior position.

the right or left side of the mother. In the dorso-anterior position, the head may be on the left side of the mother, in

FIG. 123.



Arm presentation in the abdomino-anterior position.

which case the right shoulder or arm is the presenting part: or it may be towards the right iliac fossa, when the left upper extremity is the presenting part. In the abdomino-anterior positions, the head may be directed to the right or left side of the mother. When it is to the left, the left arm, and when it is to the right, the right arm, of the fœtus presents. As far as I am aware, no observations have been made to determine the relative frequency with which the child's head lies to the right or left side in arm cases. But this is probably a point of little importance, as the management is the same in all these variations of position. Numerous complications are met with in transverse presentations. Besides the presentation of any part of the body, the arm and head, both arms, the funis and arm, or an arm and foot, may descend together. Perhaps we scarcely ought to consider the descent of the arm and head, or of the hand and foot, as strictly transverse presentations, since it is a mixture of the transverse and the cephalic or pelvic, and may terminate in the case of the hand and head, in cephalic, or in that of the hand and foot, in pelvic delivery.

Apart from the physical examination of the patient there are no distinct symptoms of the occurrence of transverse presentation, which can be depended on, before the commencement of labour, though we know that in many of these cases the preternatural position is assumed some time before the date of labour. In some cases, the width of the uterus and abdomen is noticeable; but when this is the case, it is difficult to form, from the appearance alone, a diagnosis between the child lying in the transverse diameter of the uterus, and twin pregnancy. In many cases there is no deformity in the shape of the uterus. In some women, who are the subjects of cross-births, uterine cramps and spasms are complained of; but in others nothing of this kind occurs, and labour comes on more slowly, and, one may almost say, more insidiously than in other cases. Owing to the absence of the head from the os uteri, the dilatation goes on more slowly and painlessly than usual. This is a disadvantage, inasmuch as labour is frequently hardly suspected, and the accoucheur may not be sent for until considerable progress has been made. It often happens in transverse, still more than in pelvic presentations, that no part of the child can be felt in an examination in the early part of labour. In arm cases, it is generally the shoulder which is the primary presentation, the arm and hand coming down as the labour progresses. When the shoulder presents, the transverse position of the long diameter of the child frequently keeps it above the brim of the pelvis for a considerable time after the commencement of the dilatation of the os uteri. When the arm or hand is felt, much care should be taken to complete the examination, so as to ascertain whether the hand is descending with the head, or whether the shoulder engages the pelvic canal. The diagnosis of arm cases is frequently difficult, and we should not give a positive opinion until we can examine satisfactorily through the os uteri. We may sometimes suspect the nature of the case by examining through the anterior wall of the cervix, before the dilatation of the os, but it is better under such circumstances never to give a positive opinion. The diagnosis between the breech and shoulder, the knee and elbow, and the hand and foot, has been given in the preceding chapter, so that it is unnecessary to repeat it here: the chief difficulty is in the diagnosis between the elbow and the knee, when both the leg and forearm are bent upon the thigh or arm. In cases of doubt, it is best to bring the hand or foot gently down, when the difference between the upper and lower extremities can easily be made out. No harm is done by this manipulation, either in knee or elbow cases. When there is a suspicion of arm or pelvic presentation, the patient should never be left until the nature of the case is clear; but this is particularly the case when the arm is the presenting part. It is, as we shall see, of the highest importance that arm presentations should be recognised as early as possible. Perplexing cases do however occur, in which the head presents, in the first instance, but is afterwards converted into a presentation of the arm, in a manner to be referred to hereafter. These are chiefly cases of deformity of the brim of the pelvis.

Up to the present day it has been thought difficult or impossible to diagnose with anything like accuracy the position of the fœtus in utero in ordinary and extraordinary cases of pregnancy. In women in whom the abdominal parietes and the walls of the uterus are very thin, the limbs and different parts of the child may with care be distinguished; and in many cases the fœtal head may be felt distinctly in the eighth or ninth month through the anterior portion of the cervix uteri, on making a vaginal examination. Beyond this no great attention had ever been paid to the subject. My friend and former pupil, Mr. Gustavus Murray, who has been recently studying in Vienna, informs me that Dr. Braun, the distinguished professor of midwifery in that city, devotes himself very successfully to the demonstration of the fœtal position in the latter months of pregnancy. The means used by Prof. Braun are percussion, auscultation, and palpation externally, aided by digital examinations internally. By percussion, the boundaries of the gravid uterus, the position of the bulky portions of the fœtus, as the head and trunk, and the quantity of liquor amnii, particularly when this is in excess, can be ascertained. By auscultation, the situation of the fœtal heart, and the site of the placental attachment, can be made out. By digital examination of the contents of the lower part of the uterus, through the os and anterior wall of the expanded cervix, we get, sometimes positive, and always approximative, information in cases of head, nates, footling and arm, or placental presentations. As an instance of Prof. Braun's method, we may take a case in which the fœtus is waiting in the last month of pregnancy for delivery in the first vertex position. The fœtal head may be felt by the forefinger of the right hand in the vagina, through the os and anterior segment of the cervix, lying rather more on the left side of the pelvis than the right. If at the same time two or three fingers of the left hand are placed externally in the left inguinal region, and pressure made into the pelvic brim, the fœtal head will be felt by the two hands. The fœtal heart will be heard about midway between the anterior superior process of the left ilium and the umbilicus. Above the pelvic brim, on the left of the median line of the abdomen, the curved outline of the fœtal spine may be made out, with the nates at its summit, and the inferior extremities will be found coiled up and presenting towards the upper and right side of the fundus uteri. During the manipulations the upper and lower extremities may be felt moving, chiefly on the right side of the uterus. The mass of the liquor amnii is on the right side. Here the vibration of the fluid is most distinct on palpation, while the left half of the gravid uterus is most dull on percussion. In arm presentations there is the absence of the head in the pelvis on making a digital examination, and the cranium may be felt above the pelvic brim, either on the right or left side. With care it can sometimes be ascertained whether the anterior or posterior aspect of the fœtus is turned towards the abdomen of the mother, by the different sensations conveyed to the finger by the convex dorsal surface of the child and the concave ventral surface, upon which the anterior and posterior extremities are collected.

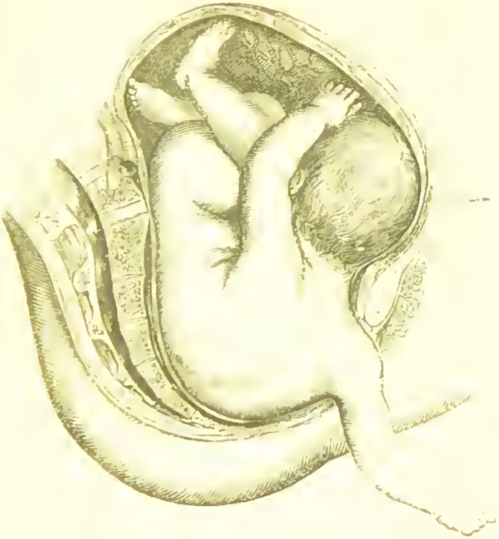
The causes of transverse presentations have been mentioned when treating of the natural attitude and position of the fœtus in utero, and the causes of pelvic presentations. The arm may present because of the death of the fœtus, also from obliquity of the gravid uterus, contraction of the pelvic brim, violent uterine contractions, twins, and excessive movements of the fœtus itself. These are the principal causes of transverse presentations. In the case of a dead fœtus, the loss of the adaptive movements of the child and the alteration in the specific gravity of the head are evidently the chief sources of the frequent pelvic and transverse presentations which are met with. In obliquity of the gravid uterus, we can easily understand that the corresponding oblique position of the fœtus may lead to the lodgment of the head above the brim, and its protrusion into the right or left iliac fossa, while the shoulder descends. We have direct evidence that contraction of the pelvic brim is a cause of arm presentation in cases in which, with slight pelvic deformity, the head presents in the first instance, but the shoulder and arm subsequently descend. Cases of this kind have often been met with several times successively in the same patient. In these cases the head cannot easily enter the brim; the force of the uterine contractions doubles the neck of the child, and the shoulder, as a smaller part than the cranium, is urged into the pelvis. It is highly probable that irregular or violent contractions of the uterus before or at the commencement of labour may cause shoulder presentations. This explanation is the only one apparently applicable to cases which are met with in which, without pelvic deformity, the same woman suffers in successive labours from the presentation of the child's arm. In these cases excessive and painful movements, which are evidently those of the uterus, are complained of. No doubt in different women different degrees of uterine excitability exist, and we are obliged to look to the mother for the cause, in cases of repeated mal-presentation. Excessive movements of the fœtus, and great distension of the uterus with liquor amnii, so as to deprive the fœtus of the moulding influence of the normal ovoid uterus, are also causes of arm as well as of pelvic presentations. In twin cases, it frequently happens that one child is delivered with cephalic presentation, and the other with the breech or arm. It sometimes occurs in twin cases that both children descend with arm presentations.

The following is a history of what generally occurs in arm cases, when the pelvis is of average capacity, the child living, and of ordinary size, and when no assistance is given:—The first stage of labour, as already mentioned, is slow, and the pains are inefficient until the shoulder fully engages the os uteri. After the rupture of the membranes, which may occur at any time, there is usually a pause in the progress of labour. The liquor amnii is quickly discharged, but some time elapses before the presenting part of the child comes to exert full pressure on the os and cervix uteri. When the shoulder and upper part of the body of the child is low in the pelvis before the escape of the liquor amnii, the pains are at once increased in severity, and the fruitless efforts at the expulsion of the fœtus soon become dangerous to the child and the mother. The shoulder is the point, as it were, of a large wedge, one side of which is formed by the neck and head, and the other by the arm and pelvis, of the child. Its passage through the pelvis in this position is impossible. If the case proceeds, the pressure on the fœtus becomes immense, and its long continuance frequently destroys the child by arrest of the circulation in the placenta and funis, or by mechanical compression of the body. The danger to the mother is very great. Either the vaginal discharges become offensive, and inflammation and sloughing of the parturient canal occur; the woman dies of exhaustion, worn out by the long-continued struggle; or the uterus is ruptured, and she perishes in this manner. Probably, at the present time, a case rarely occurs in which a patient suffering from arm presentation passes on to the extreme catastrophe without some assistance; but, when rupture of the uterus does not occur, cases are sometimes seen which have spread over several days. It may be said, that when the fœtus is mature, and the pelvis of ordinary size, death, both to the mother and fœtus, is well nigh inevitable, in cases of arm presentation, where no assistance is given. In protracted arm cases, it frequently happens that the uterus is exhausted by its exertions before the time of artificial delivery, and that frightful post partum hæmorrhage occurs from atony of the uterus.

But there are natural modes of delivery in certain cases, and under certain conditions, in arm cases. Denman found that in cases of this kind, when the pelvis was large, and the child dead or premature, the long-continued efforts of the uterus were sometimes equal to delivery without danger to the mother. He observed that in some cases the arm and shoulder passed above the pelvic brim during the continuance of the pains, and the body and the pelvis came down, the child being delivered by the breech. This mode of delivery was termed by Denman Spontaneous Evolution, version, or turning, and the explanation of this great obstetrician was received by his contemporaries. After a time, however, the explanation of Denman was called in question by an accurate observer, Dr. Douglas, of Dublin. This physician observed cases in which, the fœtus being immature or dead, and capable of doubling upon itself, the arm and shoulder remained down, but became fixed against the arch of the pubis. The shoulder being fixed against the pubis, he observed the body and spine of the child to become bent, the nates to descend to the perinæum, and the lower half of the child to sweep down the sacrum and soft parts of the parturient canal, until the breech and inferior extremities were expelled. The other arm then came down, and the head was delivered as in breech cases. Dr. Douglas termed this manœuvre Spontaneous Expulsion, in contradistinction to the spontaneous evolution of Denman. Other observers corroborated the explanation offered by Douglas, and Denman was supposed to have been in error when he said that the arm receded before the descent of the body and breech. Later authors have, however, ascertained that both Denman and Douglas were right, and that in one class of cases the child is born in the manner described without recession of the arm, while in another the arm does not recede, but the shoulders become fixed to the pubic arch, forming a ginglimus or hinge in this direction, while the breech and body sweep down the sacrum and perinæum. These terminations form, however, the rare exceptions in breech cases, and though it is necessary to understand them, they must never be expected or waited for in the management of breech cases. The following engravings illustrate the process of spontaneous expulsion, which occurs more frequently than spontaneous evolution. (Figs. 124, 5 and 6.)

The operative treatment of arm and shoulder presentations is one of the most important within the range of obstetrics. The conduct of these cases calls for all the knowledge and judgment of the accoucheur, as his proceedings must vary considerably, according to the stage of labour and the particular complication of each individual case. It may be said of all cases of arm and shoulder presentation made out at the commencement of labour, that every precaution should be taken to preserve the liquor amnii from discharge. With this view, the necessary examinations should be made as gently as possible, taking care to exert no pressure upon the membranes when they are made tense by a pain. The patient should be kept in the horizontal position, and cautioned against making efforts at bearing down, either during the pains, or in evacuating the rectum or bladder. In cases where the shoulder presents alone, or where the arm hangs in the vagina and the shoulder engages the os uteri, the proper remedy, when the child is alive and at the full period, is the operation of turning. The earlier this operation is performed after

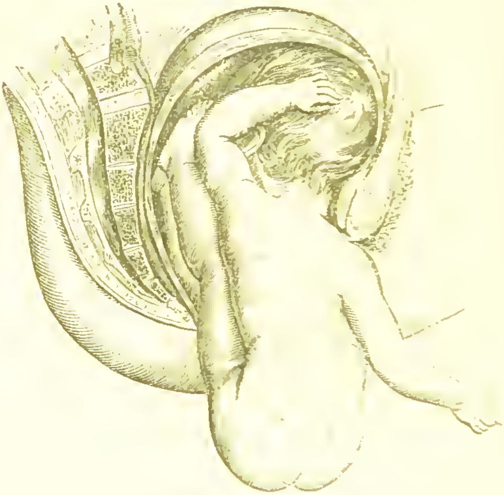
FIG. 124.



Commencement of spontaneous expulsion.

the detection of the presentation the better, unless in cases where the child is so fully engaged in the pelvis, or the uterine actions are so powerful, that means are necessary to relax the uterus, in order to make the operation practicable, and to avert as far as possible the danger of rupture of the uterus, or inflammation of the parturient canal. When the hand and head present together, no great efforts at putting up the arm or hand should be made, if the head has not fairly entered the pelvis, as by so doing the head may be pushed aside above the brim, and the case converted into one of purely arm and shoulder presentation. The arm and head form a less formidable complication than the conversion of such cases into the descent of the shoulder, as the hand and head may be delivered together with safety to mother and child. When the hand and head have entered the pelvis, and present at the os uteri, the hand may sometimes be passed up by the side of the head, in an interval between two pains, and if kept above the head until the pain comes on, it is swept above the brim, and the head descends alone. When the child is dead, but at the full term, in arm or shoulder cases, and so

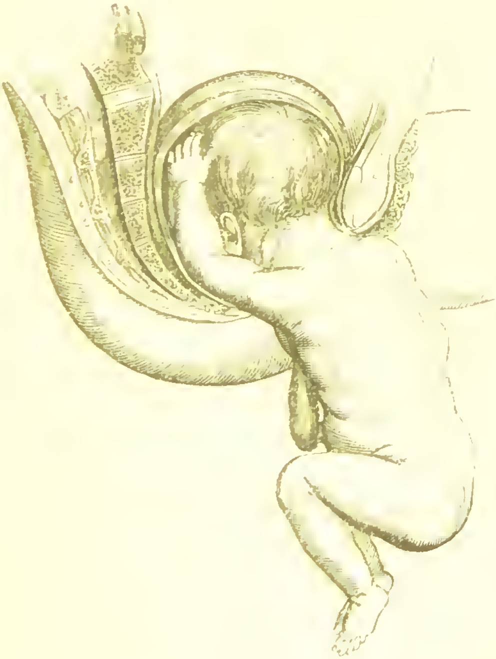
FIG. 125.



Further progress of spontaneous expulsion.

firmly wedged and low in the pelvis as to render turning difficult or impossible, the best practice is to eviscerate the chest and abdomen, and then to bring down the pelvis of the fœtus by the crochet. In the case of dead children at the full term, when the case is made out early in labour, turning is an easier operation, and less troublesome and dangerous to the mother, than protraction of the case, and evisceration and extraction. In rare cases, when the pelvis is very capacious, the action of the uterus powerful, and the fœtus small, or dead, or premature, the accoucheur may sometimes be called, when, the shoulder and arm being felt at the pubis, the ribs and body of the child occupying the lower part of the pelvis and pressing upon the perinæum, and some advance of this part of the child occurring at each pain, it is evident that the spontaneous expulsion of Douglas will terminate the delivery. Sometimes this spontaneous expulsion of the child takes place with great rapidity. I was once summoned to turn a child, at no great distance from my own house, but before I arrived the woman had been delivered spontaneously. In other and rarer cases, the arm and shoulder will ascend, and the nates come down, under the influence of the pains, as in the spontaneous version or evolution of Denman. As regards the great and most common procedure necessary in transverse presentations—namely, turning by the feet—the circumstances of the operation are very much varied, according as the amnion is ruptured or not; or the presenting part high or low in the pelvis; and the length of time which has elapsed in these cases between the commencement of labour and the performance of the operation. In transverse cases, auscultation of the

FIG. 126.



Termination of spontaneous expulsion.

fœtal heart is imperative, as upon the life or death of the child the alternative of evisceration or turning may sometimes depend. In many arm and shoulder cases, the child has been dead for some time before the commencement of labour, and the cuticle is falling off or the limb is putrid. In others, a loop of funis is down with the arm, and its pulseless and flaccid state informs us of the death of the fœtus. The peculiarities incident to turning in transverse cases under every variety of circumstance will have to be considered when we come to the operative part of the present work. It may be mentioned, that when the arm presents in the case of the second child in twin cases, the same treatment is to be followed as though a single child had presented with the arm. The operation of turning is generally easy in such cases, from the smallness of the child and the dilatation of the passages. No doubt in arm cases the easiest and also the most difficult conditions for the operation of turning are met with. In a case where the liquor amnii remains undischarged, and the arm is found at the os uteri, the fœtus is moved almost as easily as a boat in water, the hand of the accoucheur can be introduced with comparative ease, and turning is a simple operation. But when the patient has been in labour, and the liquor amnii discharged, it may be for twenty-four, forty-eight, or more hours, the shoulder is jammed into the pelvis, and held as if in a vice. It is most difficult either to introduce the hand, or to move the child, and turning is now one of the most difficult, if not the most difficult, operation in obstetrics. The mortality to the mother and the child, but particularly the child, under these circumstances, is very great. Dr. Lee, in his "Clinical Midwifery," relates fifty-nine cases, and records the death of the mother in eleven, and the death of the child in thirty-two cases. These cases were amongst the most severe that could be met with in consultation practice; and such results should imprint upon accoucheurs the necessity of an early diagnosis, and prompt action in this form of dystocia. Dr. Fleetwood Churchill has collected the statistics of 112,140 cases, in which the superior extremities presented 484 times, or, taking the average, once in $231\frac{3}{4}$ cases. In 242 cases of presentation in which the results to the mother and child were recorded, 127 children were lost, or rather more than one in two, and twenty-six mothers died, or about one in nine. All statistics tend to show that in this complication, more than in any other, danger both to the mother and child increases with the prolonged duration of labour.

CHAPTER XXIX.

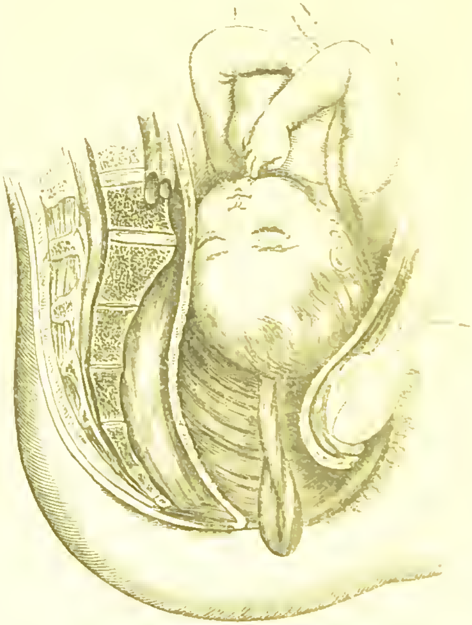
FUNIS PRESENTATIONS.

The Funis may present alone at the beginning of labour, or it may descend with the head, arm, nates, and any other presentation of the fœtus. Its positive frequency is greatest in head cases, but relatively—that is, considering the small number of arm as compared with vertex cases—it is more frequent in arm and shoulder presentations than in other varieties of labour. This complication may occur at any time during labour. It may happen before the evacuation of the liquor amnii; when the head or presenting part is passing the os uteri; or when it is emerging from the perinæum.

The Causes of funis presentations are various. In arm cases, where the body of the child lies transversely, the anatomical position of the umbilicus and the funis favours the descent of the cord, and this descent is still further promoted by the fact, that in shoulder cases the circular os uteri does not at all points closely embrace the presenting part, on account of its irregularities. In its contractions, the uterus cannot sweep equably over the shoulder as it does in cranial presentations, during the pains, so as to carry up the funis when there is any tendency to prolapse. Presentations of the feet and breech, or of the hands and feet, are frequently complicated with the funis, and from the same causes. In the case of head presentations, length of the cord, small size of the head, the descent of the hand with the head, a large quantity of liquor amnii, and its sudden evacuation, or a pelvis above the average size, may occasion prolapsus of the cord. It happens occasionally in twin cases, particularly in the delivery of the second child. The position of the placenta is also influential as a cause of funis presentations. The cord is prone to descend when the placenta is partially attached to the os uteri, or when the placenta is fixed to the lateral walls of the uterus instead of to the fundus, or when the placenta being seated near the fundus, the cord is inserted into the edge instead of the centre of its diameter. Mr. Roberton, of Manchester, points out that, in cases of contraction of the brim of the pelvis, where, on the rupture of the membranes, the head does not descend upon the os uteri, but remains suspended at the brim, the funis is very apt to float down with the liquor amnii and pass through the os. An interesting series of cases has been reported by Mr. Roberton, which fully bears out this view. When the head of the fœtus remains above the os uteri, the relations of the os to the presenting part very much resemble those which obtain in shoulder or nates cases. There is a want of that apposition between the os uteri and the fœtal head which prevents prolapsus of the cord in perfectly natural cases.

As regards the frequency of this complication, Dr. Fleetwood Churchill has collected 128,224 cases of all presentations, which yielded 579 funis cases, or about 1 in 221½. As regards the mother, labour is not in the least degree ren-

FIG. 127.

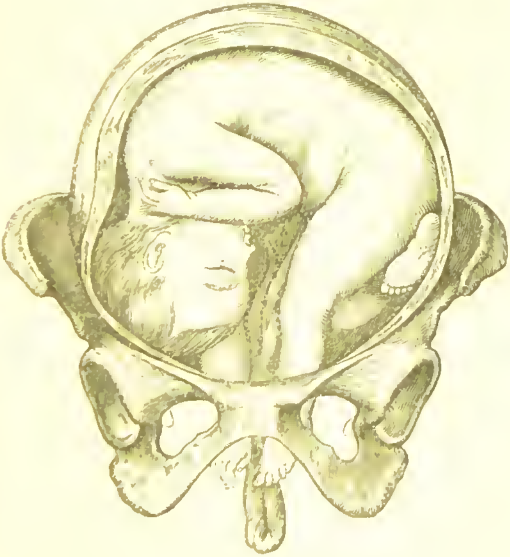


Presentation of the funis, with the head in the first position.

dered more unfavourable than usual, but the mortality to the fœtus is very great. Considerably more than 1 in 2 of the children die, in cases where the cord presents. In arm presentations the mortality is rather more than 1 in 2. It will be remembered that in footling cases the mortality was 1 in 3½, and in breech cases, 1 in 2½. In turning, from all causes, the fœtal mortality is rather more than 1 in 3. Thus the presentation of the funis is more dangerous to the child than any other variety of labour.

The symptoms of funis presentations are sufficiently well marked to make their diagnosis easy. Sometimes a loop of cord, several inches in length, hangs from the vagina. It may be pulsating, or it may be cold and flaccid. But in one case the umbilical pulse, and in the other the twisted arrangement of the cord, or an ocular inspection, will remove all doubt. In cases where the cord comes down with the advancing part of the child, or presents with it at the os uteri, the only part of the full-grown fœtus which can be mistaken for it is the closed hand or the toes. The knuckles, when only part of the hand is felt, or the row of toes, may feel somewhat like the end of a

FIG. 123.



Presentation of the funis, with a hand and foot.

loop of cord. But the presence or absence of pulsation, and the examination of a few inches of the cord, or enough of the extremities to reach the wrist or the ankle, will make the matter clear. There is one complication of labour which it is necessary to mention, in which a mistake respecting the cord may lead to the most serious results. In cases of ruptured uterus, a coil of the small intestine may pass through the laceration, and present in the os uteri or the passage. This has in rare instances been mistaken for the cord of a dead child, and pulled down or even cut off by ignorant or incautious persons. A case of this kind occurred in Ireland, and another in London, incredible as it may appear, within the last ten or twelve years. In a case of this description happening to a midwife, in which a medical man might be called after the rupture of the uterus and prolapse of the intestine, some little caution would be necessary to avoid mischief. An inexperienced accoucheur might pull at the supposed cord, and do the gravest injury, particularly if the previous history of the case had been kept from him.

Of course, the cause of the great fœtal mortality in funis cases is the pressure exerted upon the cord, between the presenting parts of the child and the hard and soft parts of the mother. The child dies of asphyxia, the fœtal circulation being in severe cases entirely cut off from the respiratory functions of the placenta. We may compare the child under the circumstances of funis presentation to cases of turning, to cases in which the arm, breech, or feet present, or even to cases in which the placenta is separated, or the contractions of the uterus are so intense and continuous as to prevent the circulation of the blood in the maternal side of the placenta. The comparison between the presentation of the funis, and the descent of the nates or feet foremost, is very obvious. Wherever the order of labour is such that the funis, or any portion of it, precedes the descent of the more bulky portions of the fœtus, before the birth of the head, the case is in principle essentially one of funis presentation. Thus, in footling, breech, and turning cases, as soon as the umbilicus engages in the pelvis, pressure is exerted on the cord, and the cases resemble presentation of the funis. The mortality depends on the length of time to which the funis is subject to pressure, and the degree of the pressure during the exit of the fœtus. Thus it is greatest in funis cases proper, in which the cord comes before or with the presenting part, and is thus subjected to pressure during the whole of labour. Next to this, footling cases are the most fatal to the child, as here the pressure on the cord commences as the umbilicus descends through the soft parts, and these have been but little distended by the descent of the feet and breech in succession. In breech cases, the mortality is less than in footling cases, because the soft parts have been distended by the passage of the nates with the feet doubled up towards the abdomen. In cases of the descent of the cord with the head, in cranial or face presentations, the pressure exerted on the cord is greater than under any other circumstances, but it is of short duration, since as soon as air can reach the mouth of the fœtus, pressure on the cord becomes of little consequence. No very just comparison can be made between the mortality in cases of turning, and funis presentations, because the great mortality to the fœtus in turning, depends on other causes as well as upon the pressure upon the cord. Certain other circumstances besides the actual presentation exert an influence upon the mortality in funis cases. The younger the fœtus, for instance, the more safely pressure is borne, and the longer it may be continued without a fatal result. The risks of a fatal result to the child, when the funis presents in a first labour, are great, whatever the part presenting with the cord. They are much less in the case of patients who have had many and easy labours. The danger is also greater when the fœtus is male than female. The least dangerous cases of cord presentation are those in which it happens to the second child in twin cases, especially when, as frequently happens, the second child is smaller than the first. The danger is increased when the pains are very frequent and prolonged, but when the pains are moderate, and with a fair interval, the child recovers from the effects of the pressure of one pain before another comes on. Care should always be taken to inform the friends of the patient of the danger in which the child is placed by the descent of the funis.

The principle of Treatment in funis presentation is, the removal of the cord from pressure, or subjecting it to compression for as short a time as possible. These objects may be carried out by the Reposition of the Cord within the uterus; by placing it in such a situation in the pelvis as to escape Pressure as far as is practicable; or by artificial delivery, as by Turning, or the use of the Forceps. No one method can be advised for the treatment of such cases. The principle of management being held in view, the means adopted in individual cases must depend upon the exigencies which attend them. As the mother is not in danger from this casualty, no steps should be taken to secure the child which are likely to bring the mother into danger, as this would be substituting a greater for a lesser evil.

A primary rule in the management of these cases is, the preservation of the Liquor Amnii. As long as the membranes remain unbroken, it is hardly possible for the child to be destroyed by compression of the cord, and not until they are broken should any attempt be made to replace the funis. It cannot be done effectually; the child is as yet in little or no danger; and attempts at manipulation must hazard the rupture of the membranes. The more labour progresses before the evacuation of the amnion, the shorter will be the time of serious compression, and the less will be the amount of compression, because of the gradual dilatation of the soft parts under fluid pressure.

The Reposition of the Cord within the uterus is the most satisfactory method of treatment we can adopt, but unfortunately it is not always practicable, and the pains often cause the renewed descent of the cord after its temporary replacement. The degree to which the cord should be returned is a matter of some difference of opinion. Sir Richard Croft recommended that the cord should be carried up into the uterus so as to hang it upon the limbs of the child. Others, as Arneth, of Vienna, advise that it should be returned above the head, and allowed to remain in the hollow formed by the neck. No doubt, the latter answers every purpose, if the cord will keep there, since children are frequently born with the cord coiled once or twice round the neck without injury, and the introduction of the hand into the uterus during labour is necessarily attended with some risk to the mother, even in the most favourable cases. Various methods of procedure have been advised for the reposition of the cord. The most simple instrumental method is by the use of a whalebone needle or bodkin, and a loop of tape. This, as Dr. Ramsbotham remarks, has the advantage of being made extemporaneously in a few minutes in the lying-in room. A flat piece of moderately flexible whalebone, about half an inch in breadth and a foot in length, and a yard of tape, are all that is necessary for its construction. An eye or hole should be made near one extremity of the whalebone, large enough to allow the tape to run in it readily. In using it a loop of the tape should be passed through the eye, and the end of the loop of funis should be included in the loop of the tape, when the ends of the tape should be drawn so as to bring the loop of funis towards the eye of the instrument, and to retain it there without exerting pressure enough on the cord to interfere with the placento-fœtal circulation. The whalebone should now be passed into the uterus by the side of the presenting part, in an interval between the pains, and after having been kept there during a pain, the tape may be brought away by drawing at one of the strings, and the slip of whalebone afterwards removed. If the noose be relaxed a little, so as to avoid strangulation of the cord, there can be no harm in leaving the instrument in the utero-vaginal canal, as it offers no impediment to the progress of labour. Michælis, of Kiel, recommended that a large-sized, male, gum-elastic, stiletted catheter should be used for the same purpose. He advised that the ligature should be passed *through* the loop of funis, when, being drawn loosely to the eye of the catheter, and the stilette being introduced only so as to avoid the possibility of doing injury, the instrument is to be passed above the head or presenting part, and left there, the stilette being withdrawn, until the completion of labour. But at the present time, Michælis has, I believe, abandoned his ingenious instrument for the use of the fingers. There is no reason why the cord should not, when it is sufficiently low to admit of manipulation, and when it returns after reposition, be pierced with a needle and thread or worsted, in such a way as to escape the vessels, and be tied to the end of a slip of whalebone, which might then be returned, and kept *in situ* until the completion of labour. But in ordinary cases, the accoucheur can do more with the hand and fingers than with the most ingenious instruments. In returning the cord with the hand, two or three fingers, of the right or left hand, as may be most convenient, should be introduced by the side of the head or presenting part, and with the tips of the fingers the prolapsed portion of the cord, being gathered together, should be pressed upwards during an interval of freedom from pain, and retained above the presenting part until the next pain comes on. When the uterine contraction reaches the ends of the fingers, they should be withdrawn, so as, if possible, to leave the funis within the grasp of the uterus. The contraction of the uterus will, if the operation be successful, sweep the cord upwards, instead of expelling it. It may, however, come down again when the uterus is relaxed, or it may be extruded by the succeeding pains, and require other attempts of the same kind to keep it above the presenting part. Drs. M'Clintock and Hardy, whose directions for the reposition of the cord are very excellent, advise that in attempting its reduction by the hand, the woman should lie upon the side opposite to that on which the cord protrudes; that is, if the cord be felt on the right side of the pelvis, the woman should lie on her left side, and *vice versâ*. They also recommend that before its return it should be drawn, if possible, towards the pubis, as the shallowness of the pelvis in this situation renders the return of the procident cord more easy than when it lies towards the sacrum. As long as the pulsation of the cord is vigorous, we should not be deterred by difficulties in attempting its reposition, as this is sometimes effected only after repeated trials.

When, in spite of our endeavours, the cord slips down again at every pain, various other means besides the loop and catheter or slip of whalebone have been recommended for keeping the funis above the presenting part. This may sometimes be done by passing a wedge of sponge up after the cord, as recommended by Dr. Collins, so that when the pains come on, the sponge is compressed between the presentation and the walls of the canal, and the further descent of the funis prevented. Sometimes, where the extent of funis prolapsed is considerable, and the cord thin, so as easily to slip down, some authorities have recommended that it should be gathered together, and put in a soft leather pouch or bag, the mouth of which should be drawn together sufficiently to keep the mass in the bag, but not to constrict the cord. The bag is then to be passed up within the os uteri by the fingers. This manœuvre substitutes a considerable mass for the thin lubricous cord, and is less likely to be protruded after its reposition. The bag remains, when the proceeding is successful, until the child is expelled. This operation is, however, difficult, and one now rarely, if ever, attempted.

When the cord cannot be returned or retained within the uterus, it becomes necessary to place the prolapsed cord in such a position in the pelvis that it may be compressed as little as possible during the passage of the child. It should be brought, as recommended by Dr. Merriman, into the oblique diameter of the pelvis, opposite to that which is occupied by the child. In a vertex case in the first position, with the head in the right oblique diameter, the funis should be kept as closely as possible to the left sacro-iliac synchondrosis; in the second position, with the head in the left oblique diameter, it should be applied to the right sacro-iliac synchondrosis, and in both cases the rectum should be emptied, but particularly the first, as the cord then lies between the side of the child's head and the rectum of the mother. In other presentations, when no other assistance can be rendered or seems necessary, the cord should be shifted as far as possible into that part of the pelvis which is least occupied by the child. It should rarely, if ever, be brought permanently towards the pubic arch, as in this position the effects of pressure are generally very great. In cases of large pelvis, in multiparous women, when the pains are moderately strong, and occurring at proper intervals, the passages being well relaxed, and labour completed in a short time, the careful arrangement of the position of the cord, without its reposition, will often be sufficient to secure the safety of the fœtus. In primiparous women, or where there is rigidity of the soft parts and a small pelvis, such measures are of little or no avail in arresting the long effects of pressure.

The propriety of Turning in cases of funis presentation, combined with any other part of the child than its pelvic extremity, is one of the vexed questions of obstetrics. Many eminent authorities have commended, and others condemned, this practice. The truth is, that the fitness of turning for any particular case requires great tact and judgment, and admits of no reduction to rule. Mauriceau performed it in a number of cases with great success in saving the child. So did Boivin and Lachapelle, and so have many contemporary accoucheurs. The strong point in the operation is, that it enables us to complete delivery in a shorter time than would otherwise be the case, and in this way the chances of safety to the child are increased. The weak points are, that the operation is not perfect, considered in relation to the object we have in view. It does not deliver the child from danger, but substitutes the risk of pressure from the shoulders and head upon the cord after the passages have been distended by the breech, for the primary pressure of the cord by the head without any previous distension of the parturient canal. Of course, in arm cases in which the funis presents, version is performed, but with reference rather to the arm than the funis complication. It would be very interesting to have a statistical comparison between the results to the child in those cases in which the funis presents in combination with the pelvic extremity and those in which it presents with the cephalic end of the fœtus. But I believe no such statistic exists, and, in its absence, we must consider the question of turning upon other grounds. In this country, the tendency, in recent years, has been to consider, with Dr. Robert Lee, that turning should rarely be practised. I believe the cases in which version is the proper operation, simply on account of funis presentation, are rare; but there are other contingencies, such as moderate contraction of the pelvis, cases where the pelvis is capacious, where other means have been tried in vain, and where turning can be easily performed, but where there is evidence that the child is passing into a dangerous state, in which the operation of turning may save fœtal life without more than very slight additional hazard to the mother.

In cases where the labour has sufficiently advanced, the use of the Forceps or the Vectis, the administration of the ergot of rye or a stimulating enema, are of great value in completing delivery. These means are to be reserved for those cases in which prolapsus occurs, or continues, when the head is low in the pelvis, and the os uteri is fully dilated. In cases where the funis is complicated with breech or footling presentation, the means described when speaking of breech cases, for effecting delivery and preserving the child, should be practised.

When the cord remains pulseless and flaccid for a considerable time, we may conclude that the child is already dead, and we may save ourselves from anxiety or attempts at delivery on account of the fœtus. We must not, however, be in too great a hurry to consider the child beyond hope. Cases are on record in which the cord being pressed upon from above, the loop hanging down is pulseless from pressure on the arteries, but the heart may beat for a considerable time after this, and the child ultimately be born alive. Sometimes in the conduct of these cases, the cord will almost cease to pulsate and the heart of the child will become very feeble, but nevertheless, from some alteration of position, the heart rallies and the pulsation of the cord is restored. Those cases in which the cord comes down with the head, most easily admit of the reposition of the cord, whereas, in breech cases, the cord has a great tendency to come down after its replacement. Although when the cord descends before the rupture of the liquor amnii, the child is in no danger as long as the membranes remain intact, such cases are very dangerous to the child from the length of time during which it is generally subjected to pressure. On the contrary, when the cord descends towards the completion of labour, the risks of the child are less, because we generally have it in our power to complete delivery within a given time in such cases. The length of time the cord may prolapse in some cases without destroying the child, is extraordinary. I once knew a case where it was prolapsed three whole days, but was afterwards reposited, and the child was born alive.

CHAPTER XXX.

PLACENTAL PRESENTATION.

The subject of Placenta Prævia is related both to the varieties of Presentation, and, in its most dangerous symptom, to the different forms of Hæmorrhage. Still, as it is undoubtedly one of the forms of presentation, and as its attendant hæmorrhage is peculiar and in many respects distinct from ordinary flooding before or after delivery, I prefer to consider it in the present place, having already treated of the different forms of presentation belonging to the head, trunk, and extremities of the fœtus, and prolapsus of the cord.

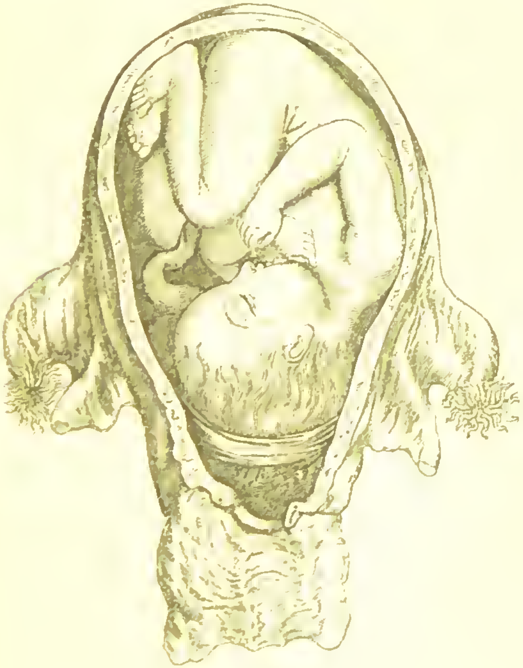
The natural site for the attachment of the placenta is either the right or left side of the cavity of the fundus uteri, generally the right. It is only rarely attached to the anterior or posterior walls of the uterus, in a central position. It may also be attached to the uterine walls in the middle portions of the organ, between the fundus and the cervix. In placenta prævia, ordinarily so called, it is attached over the whole of the os and cervix uteri, or it may be implanted over some part of the margin of the os, and one half or more of the cervix. The one has been termed Placenta Centralis, the other Placenta Lateralis. When the placenta is attached to the lower part of the uterus, it is observed that the placenta is generally of greater superficial size than when it is developed at the fundus. This probably depends on the greater relative expansion of the cervix uteri, during the latter months, as compared with the fundus. The cause of the attachment of the placenta to the lower segment of the uterus, is at present undetermined. Dr. Barnes, in his admirable "Lettsomian Lectures," has advanced the supposition that the chorionic envelope of the ovum is, in the early months, in intimate and vascular relation with the decidua vera in its entire superficies, and that various accidental circumstances may determine the site at which the united chorion and decidua may be developed into the placenta. I submit, however, that although in the middle and latter months the chorion is everywhere in contact with the decidua vera, it is not so up to the second month, at, and prior to which time, the site of the placenta has been determined. Up to this period, the ovum hangs in the cavity of the decidual lining of the uterus, attached to it only at one point—namely, that in which the placenta is in process of development, so that the view advanced by Dr. Barnes can hardly be the real cause of placenta prævia. Legroux adverts to the fact that placenta prævia is most frequently met with in multiparous women, and supposes that it arises from the greater extent of the uterine cavity in such cases, which allows the ovum to spread its attachments lower than natural. My own opinion is, that placenta prævia is caused by the impregnation of the ovule, or at least the arrest of the impregnated ovule, after it has descended through the Fallopian tube and uterus, so as to reach the upper part of the cervix uteri, this being the last point at which the ovule retains its capability of impregnation and attachment to the uterine surface. In some women there is a disposition to the repetition of placenta prævia in successive pregnancies. In such cases it would appear that the decidual surface of the upper part of the cavity of the fundus could not receive or support the ovum. We know that in cases of Fallopian gestation, the impregnated ovule attaches itself to the decidual lining of the Fallopian tube. There is no more difficulty in supposing that, instead of being arrested or impregnated in the tube, or in the fundus, it may in some cases pass on to the lower part of the cavity of the uterus, the point at which it joins the cervical cavity, in which case we have placenta prævia.

Up to the fifth month, the development of the ovum generally proceeds in the ordinary manner in placenta prævia, and if abortion occurs before this time, there is nothing which distinctly indicates the site of the placenta. After this date, the development of the cervix proceeds, and, in its expansion, partial separation of the placenta from its attachment is prone to occur. The irritation of the uterus by the placental attachment to the cervix, and the separations which occur, often lead to abortion or to delivery before the natural term in these cases. Sometimes patients go on to the full term when suffering from this complication, without the occurrence of hæmorrhage before the commencement of labour.

The symptoms of placenta prævia in the latter months are usually sufficiently distinctive. Occasional hæmorrhage occurs, generally between the seventh month and the end of gestation. The discharge commonly takes place suddenly, without pain, and ceases after a while, or the drain may continue for a considerable time. The nearer the patient is to the full term, the more violent is the loss of blood. The gush may take place after some exertion, or when the patient is following her usual avocations, or when she is asleep. The loss is sometimes so sudden and so enormous, that the woman is dead before the medical attendant can be summoned. Generally, there are several sudden losses, to a less extent, before the advent of labour. Flooding may recur at variable intervals, of a few days, a week, a fortnight, or it may break out at the dates of the catamenial periods. Placental presentation should always be suspected whenever hæmorrhage occurs in the latter part of pregnancy. Sometimes labour comes on after the first discharge; at others, there are no traces of uterine action until after several attacks of flooding. There are no sensations belonging to the patient herself which indicate malposition of the placenta, but the uterine soufflet is heard in these cases with most distinctness in one of the iliac regions, or the hypogastrium. When we examine internally, if the os uteri has dilated, the soft mass of the placenta can be felt between the finger and the presenting part of the child. The soft placentary layer may be felt in the entire field of the os uteri, or occupying only one margin of the os. If the flooding has been very severe, a portion of the placenta, or the greater part of the organ, may be felt protruding through the os uteri. When the os is quite closed, the placenta can sometimes be distinguished through the walls of the expanded cervix, particularly if the head presents, and the placenta lies between the finger and the fœtal cranium. In the case of breech or shoulder presentation, the detection of the placenta is more difficult. If the os uteri should be so high up in a case of suspected placental presentation, as to be beyond the reach of the finger, the whole hand should be carefully passed into the vagina, so as to enable us to reach the os and make the necessary examination. Fatal results have often happened from inattention to diagnosis in these cases. There is hardly any other critical emergency in midwifery in which an early diagnosis and prompt treatment are of such importance.

The separation of the placenta may be small in extent, or the whole or nearly the whole of the organ may be detached. What usually happens is, that at each recurrence of hæmorrhage, small portions of the placenta are detached, up to the time of labour. Before the commencement of labour, and when no symptoms of abortion are present, the cause of detachment is the developmental expansion of the cervix uteri; but when labour has set in, the active dilatation of the os and cervix, the descent of the head or presenting part, and the action of the longitudinal fibres of the uterus, combine to effect the placental separation. The most violent and dangerous cases are those in which little or no hæmorrhage occurs up to the full term, when sudden and extensive detachment takes place, the utero-placental vessels having reached their full development. The woman may, under these circumstances, be deluged with blood, and reduced to the utmost extremity of danger in a few minutes. Where partial and repeated separations occur, the uterine vessels which have been laid open contract, and the blood coagulates in that part of the placenta which has been separated. This process may be repeated several times before the coming-on of labour, and while the placenta is only partially attached over the os uteri. In rare cases it happens that the whole of the cervical portion of the placenta is detached in this manner, and little or no hæmorrhage occurs at the time of labour. In other cases of entire or partial placental presentation the cervical portion of the placenta is completely detached at the time of labour, and no serious hæmorrhage occurs after the first outbreak. Still more rarely, when the uterine action i very powerful, the pelvis capacious, the fœtus small or o moderate size, and the patient multiparous, the whole of th placenta is detached, and the fœtus and membranes expelled with such rapidity that no dangerous loss occurs. Thes cases have led some to imagine that in entire placenta prævia Nature may be trusted more than she is. But the condition are so unfavourable to the safety of the patient, that such reliance is worse than on a broken reed. This conjuncture offers little place for a Fabian plan of treatment. To wait, is generally to destroy. In a case of placenta prævia we have the circumference of the os and cervix studded with large vessels, the mouths of which gape widely open as the placenta separates, and the os and cervix dilate. And this separation and dilatation must occur. There is no escape from them, and the slow and gradual way in which the preparation for the exit of the fœtus is generally made, and which in ordinary cases tends so much to the safety of mother and child, is here their destruction. The hæmorrhage in cases of placenta prævia has been called "unavoidable" hæmorrhage,

Fig. 129.



Entire placenta prævia.

by way of distinguishing it from hæmorrhage from the fundus uteri occurring before labour, which has been termed "accidental." In the one case separation and hæmorrhage may, in the other they must, occur before the completion of delivery. Placenta prævia may of course be combined with tumours, pelvic deformity, mal-presentation, and a variety of contingencies which increase the difficulty and danger incident to this form of labour when it occurs without any complication.

The chief methods of treatment followed in cases of placenta prævia are—1. The use of the plug, or tampon. 2. Puncturing the membranes. 3. Turning the child. 4. The partial, or the entire separation and extraction of the placenta. I propose to point out in detail the cases and conditions in which these several modes of practice are most applicable.

Plugging the Vagina is adapted to cases in which, after the first loss, a continuous drain, varied by slight eruptions of blood, is going on, particularly when this occurs at the sixth or seventh month. By plugging the vagina with moderate force, the lower segment of the uterus is compressed between the plug and the contents of the uterus, an impediment is offered to the further escape of blood, and the coagulation of that already effused is promoted. Care must be taken that the plugging be not too forcible, otherwise uterine contraction and further separation may be excited by the irritation of the plug. The best methods of plugging the vagina are by introducing large strips of lint, pieces of sponge, or a silk handkerchief, dipped in vinegar-and-water, or iced-water. Pieces of ice, wrapped in lint, may be introduced. There is a great advantage in the sponge-plug—namely, in its expansion from absorbing the blood, or the secretions of the vagina. But this is, to a considerable extent, counterbalanced by the rapidity with which sponge, from the animal matter it contains, becomes fœtid in the vagina. It cannot, on this account, be allowed to remain in the passage more than a few hours. It is, therefore, the best temporary plug, but it is not adapted to cases in which continuous plugging is required. As an ordinary plug, nothing exceeds in utility strips of lint, introduced one after another until the vagina is filled up. Even in plugging with lint, or a silk handkerchief, the plug requires to be changed from time to time, as whatever the plug, the retained blood and discharges, to which air is necessarily admitted, have a tendency to become rapidly fœtid. Whatever treatment may be adopted in placenta prævia, one precaution should always be adopted—namely, to keep the patient in the horizontal position, with the pelvis somewhat raised. The temperature of the room should be cool and equable, and the diet light and unstimulating, except when the patient is suffering from the direct effects of loss of blood. Under these circumstances, brandy, ammonia, and beef-tea may be administered freely. I do not believe that in unavoidable hæmorrhage, internal astringents, such as gallic acid or the acetate of lead, are of more than the slightest use, and they tend to divert the attention of the practitioner from more important measures. With this exception, the treatment of placenta prævia in the fifth or sixth month, when the os uteri is undilated, and the flooding not dangerous in extent, is hardly distinguishable from flooding in ordinary abortions. When hæmorrhage has once occurred, the patient should be kept as quiet as possible up to delivery, lest a further separation should be produced.

Puncturing the Membranes and Evacuating the Liquor Amnii in placenta prævia is a practice of very ancient date. It is occasionally useful, and is adapted for cases in which the hæmorrhage is not of the most alarming character, where the os uteri is either closed or only dilated to a slight extent; where the pains of labour have already commenced, or where it is considered advisable to induce premature labour in this manner; where the liquor amnii is in large quantity; where turning is impossible, and where, the child being alive, it is judged best not to attempt the separation of the placenta. This operation is preferred in cases of partial attachment of the placenta over the os, where the membranes can be ruptured either by the finger, or a probe or trocar at the part ree from placenta; but it has sometimes been performed with he effect of arresting the hæmorrhage, through the placental nass, in cases of complete attachment over the os uteri. Puncturing the membranes in placenta prævia does not arrest looding simply from diminishing the size of the uterus and xciting contraction, but by lessening its size and vascular upply, and bringing down the head or presenting part of he child, so as to act as a plug to the placental site. The disadvantages of puncturing the membranes are, that turning s thereby rendered difficult, and the risk of sacrificing the child is increased. In cases where the labour is premature, nd the child non-viable, these objections do not apply at all; nor in cases where the child is dead, as craniotomy ould then be performed. It is, however, questionable whether, in these cases, the extraction of the placenta should not be preferred.

In my opinion, Turning is the great operation in placenta prævia, when the child is living and viable,—that which, if performed at the proper time, affords the greatest chances of safety both to the mother and the child. But there are circumstances in which turning is the best practice when the safety of the mother alone is concerned, the child being already dead. The conditions favourable to turning are, a dilated or dilatable state of the os uteri, the retention of the liquor amnii or a moderately relaxed state of the uterus, a pelvis of average capacity, the absence of dangerous exhaustion, or a temporary cessation of the hæmorrhage. If the placenta be attached to one side of the uterus, the hand should be introduced on the side opposite to the placental site: or if it extends over the whole os, the hand should be passed in the direction in which the attachment is least considerable, or when the separation has already taken place. The advantages of turning are, that without materially increasing the danger of the patient, and in a very short space of time, the feet and body of the child may be brought down so as to act as a tolerably efficient plug to the os and cervix uteri. During the early part of the operation, the hand and arm of the accoucheur form a tampon. Turning is generally easy in placenta prævia, at the full term, as compared with other cases in which it is required, because the contractions of the uterus are commonly less powerful than usual. The flooding itself tends to produce dilatation of the os uteri, and to weaken uterine action. It is, therefore, a less severe operation to the mother than in many other cases in which it is called for. This is particularly the case in multiparous women. As regards the state of the uterus, primiparous women, as in other cases requiring turning, offer greater difficulties than women who have borne children. When the operation of turning is performed early in placenta prævia, the proportion of mothers saved is large, and a considerable number of children are born alive. Turning should always be performed in placenta prævia, when it is considered advisable, the instant the operation is rendered practicable by the condition of the os and cervix uteri. In cases where the os uteri has been dilated for many hours, sufficiently to admit of turning, and blood or strength has been lost in the interim, we should blame, not the operation, but the delay, for a great proportion of the fatality to the mother and child. In some cases of partial placental presentation, the head may be so low, that the use of the forceps will be preferable to turning; or this operation may become necessary after the spontaneous or artificial expulsion of the placenta. In other cases, as when the head is low, and the child dead, or when the pelvis is deformed, craniotomy may be called for. Dr. Radford has advised the use of electricity, in connexion with the other methods of treatment, in these cases.

I have now to refer to the Artificial Extraction of the Placenta before the birth of the child, which has certainly been one of the most prominent points in obstetric practice during the last ten or twelve years. It is one the settlement of which is of great interest, as nothing can be more unsafe than halting between two opinions upon such a subject. From an early period, it had been remarked by accoucheurs that cases of unavoidable hæmorrhage were occasionally met with, in which the placenta was expelled spontaneously before the birth of the child, and that others occurred in which the hæmorrhage was arrested by the spontaneous separation of the placenta. The first person who seemed to have pointed out the deduction of a rule of practice from such cases was Mr. Chapman, of Ampthill. The placenta was also removed, in some cases of placenta prævia, by Mr. Kinder Wood, of Manchester, and subsequently by Dr. Radford. Probably cases have always occurred in which accoucheurs, finding the placenta loose in the vagina, or almost entirely detached, have removed it. Dr. Simpson took up this subject in 1844, and, with his usual ability and force, pointed out what he considers the advantages of this operation, the principles upon which it is founded, and the cases to which it is applicable. The tenor of Dr. Simpson's earlier writings was such as to lead to the belief that he wished to supersede in great measure the operation of turning, by the separation and extraction of the placenta. This impression has continued to a great extent up to the present time, and it is upon this impression chiefly that its opponents have attacked and denounced the operation. In one of his latest publications on the subject, in "The Lancet," 1847, vol. i., he has corrected this, and insists upon the limitation of the extraction of the placenta to cases "when the other recognised modes of management were insufficient or unsafe, or altogether impossible of application," or when the old methods of practice "were attended by extreme hazard or extreme difficulty." Dr. Simpson combined with his advocacy of this practice an exposition of his views as to the source of the hæmorrhage in placenta prævia, which met with great opposition. Dr. Hamilton and others advocated the doctrine that the hæmorrhage in placenta prævia "proceeds from the separated portion of the placenta more than from the ruptured uterine vessels." Dr. Simpson endorsed this view to the full extent, and I suspect it is this, as much as the rule of practice itself, which has excited the opposition which has been manifested. According to this hypothesis, the blood lost in separation of the placenta flows from the placental cells, the supply to these cells being kept up by vessels supplying the undetached portion of placenta. It is supposed that, as the separation proceeds, the veins of the uterine surface from which the placenta is detached, are closed so as to prevent any retrogressive hæmorrhage from the uterus.

Dr. Simpson's theory of the source of the hæmorrhage, upon which he to some extent rests his practice of separating the placenta, is, I believe, altogether untenable. No proofs of the escape of the great quantities of blood lost in these cases, from the placental surface, can be given. The theory mainly rests upon the anatomical arrangement of the uterine arteries, the placental cells, and the openings upon the placental surface. No doubt there is an unobstructed channel for the flow of blood from the curling arteries, through the placental cells and the openings found upon the placental surface, when this has been separated from the uterus. But there are, as it appears to me, valid reasons why we should believe that the sudden and great gushes of blood poured out in placenta prævia do not escape in this way. The uterine arteries are of comparatively small calibre, and the openings upon the placental surface are neither large nor numerous. Supposing one-half of the placenta to be detached, it is highly improbable, I should almost say impossible, that the profuse loss frequently met with in these cases could come from the uterine arteries entering the undetached portion of the placenta, even if they were all discharging blood simultaneously. In the cases of profuse loss which sometimes occur, when only a small portion of the placenta is detached, it is equally difficult to suppose that the blood could escape from the openings met with on a square inch of placental surface. There are, on the other hand, good reasons for believing that the uterine veins are the real sources of hæmorrhage in placenta prævia. The size of the venous openings, the valveless state of the uterine veins, the channel being unimpeded from the right auricle to the open mouths of the sinuses, furnish anatomical arguments in favour of this source for the flow of blood which are stronger than those derived from the anatomical arrangement of the uterine arteries and the placental sinuses, in favour of the opposite view. We have the facts connected with post-partum hæmorrhages. The only hæmorrhages comparable for suddenness and extent to the losses in placenta prævia are those which occur after labour, and subsequent to the expulsion of the placenta, in cases where it has been attached at the fundus uteri. In inversion of the uterus, after completion of delivery and the separation of the placenta, the flooding is known to be enormous. Here there can be no question but that the hæmorrhage takes place from the open mouths of the uterine veins. I have not observed any difference in the colour or character of the blood in post-partum hæmorrhages and those caused by placental presentation, and the weight of evidence is in favour of the venous character of the blood lost in placenta prævia. It is noticed that in this form of flooding the loss is increased during the pains, as it is believed, by the enlargement of the uterine openings by the dilatation of the os and cervix uteri, whereas, in hæmorrhage from the fundus, the flow of blood is arrested during the continuance of pain and contraction. When the separated portions of placenta have been examined, it has been found that the sinuses and cells have been filled with coagulated blood. In some cases of placenta prævia, in which the placenta has been detached and expelled artificially or spontaneously, flooding has occurred after the expulsion of the placenta. Here the blood must have been in great part from the uterine veins, yet the flooding presents no difference to that occurring from the partial separation of the placenta. The inference from all these facts appears to be, that in the hæmorrhage from placenta prævia the blood escapes in great part from the uterine surface, and not from the maternal surface of the placenta. There can be little doubt that some blood must exude from the surface of the placenta in cases of partial separation, whether the placenta be attached to the fundus or cervix; but I contend that this is not the chief source of flooding in placenta prævia.

Dr. W. F. Mackenzie, it should be mentioned, has investigated experimentally the question of the source of the blood, in hæmorrhage from partial separation of the placenta, and he contends for the arterial source of the loss in placenta prævia. In the case of a gravid bitch, when the placenta was detached so as to produce copious bleeding, the blood was seen to come from the uterus, and was arterial in character. In a post-mortem experiment on a pregnant woman, in whom the placenta had been partially detached, defibrinated blood was injected into the hypogastric arteries, and escaped freely from the arterial openings in the uterine walls. It may, however, be said of these experiments, that they have only a slight bearing on the question at issue. They are very valuable as tending to show that blood comes not from the placenta, but the uterus, in such cases. But the placenta in the lower mammalia does not so nearly resemble the human placenta as to admit of fair comparison, and we know that in other and equally authentic experiments, blood injected into the inferior cava gushes from the venous sinuses of the uterus. Much stress is laid on the circumstance that florid, or arterial blood is sometimes met with in cases of placenta prævia. This I believe to be exceptional, and, according to my own observation, the blood lost in these cases is chiefly venous, the arterial element being in comparatively small quantity.

While I thus take exception to Dr. Simpson's theory of the nature of hæmorrhage in placenta prævia, I do not question the correctness of the fact upon which he lays so much stress —namely, the frequent, and indeed common, arrest of the hæmorrhage on the entire detachment of the placenta. Dr. Simpson's theory does not appear to me to be necessary to the explanation of this matter. In my work "On Parturition," I pointed out that the separation of the placenta furnishes a source of irritation which excites the uterus generally, and the muscular structure at the site of the placenta especially, to contraction, and that in this way hæmorrhage was prevented. This is probably the reason why, in twins with separate placentæ, there is frequently no hæmorrhage between the expulsion of the first placenta and the birth of the second child. It is reasonable to suppose that the same thing occurs in placenta prævia, after the separation and extraction of the placenta, in the intervals which occur between the pains. The tendency to hæmorrhage from dilatation of the orifices of the veins during the pains is corrected by the descent of the head or presenting part, and the mechanical compression of the uterine walls.

Dr. Simpson unequivocally demonstrates that in a great number of cases recorded by various authors, both before and since the publication of his views, the placenta has been detached and the hæmorrhage arrested. There can, indeed, be no question upon this point. Those most opposed to Dr. Simpson, Dr. Robert Lee, for instance, record cases in which the hæmorrhage has ceased after the spontaneous expulsion of the placenta. The cases to which, in his most recent writings, Dr. Simpson would advise separation and extraction are those in which the evacuation of the liquor amnii is of no avail, and when the state of the patient is such as to call for interference; but where turning, or other measures of delivery, are impracticable, from rigidity, or non-development of the os and cervix uteri, or a high degree of distortion of the pelvis. He would also employ it in the case of dead, premature, or non-viable children, particularly when the uterus has contracted, or is so imperfectly developed as not to admit of turning. It is questionable if rigidity can be a valid plea for this operation, except in very rare cases. When the os uteri is sufficiently open to allow of the admission of the fingers for the purpose of separating the entire placenta, there will generally be room enough for the admission of the hand. I believe the separation and extraction of the entire placenta to be suitable for those cases in which it is attached all round the os uteri, and in which the exhaustion is so great as to render some more rapid attempt at assistance than the operation of turning, imperative. In some of these cases the patients would be killed by turning, if the haemorrhage were going on simultaneously with the operation.

The extraction of the placenta offers a means of arresting hæmorrhage, and after a short rest the patient may be sufficiently rallied to bear turning; for it must be remembered that in many of the cases in which the placenta has been extracted artificially, turning has been necessary to complete the delivery. In all cases where the child is alive and viable, delivery should be effected, by turning or the forceps, as soon as possible after the extraction of the placenta, if the state of the patient is such as to bear the operation. Extraction may be sometimes useful in cases where turning is impossible, as in cases of contraction of the uterus, or great pelvic deformity, when the removal of the placenta may arrest hæmorrhage and facilitate the operations of turning, craniotomy, or evisceration. It may also be practised in some cases of dead or premature children, when the hæmorrhage is going on, and turning is difficult from any cause. When the flooding is not profuse, and when the uterus is roomy and the waters undischarged, the extraction of the placenta before the child offers no advantage whatever. The whole subject has been ably handled by Dr. Chowne, and Dr. Fleetwood Churchill gives a very candid exposition of the advantages and disadvantages of the operation.

It is necessary to refer to the statistical arguments which have been advanced in favour of the operation. Dr. Simpson has given a table of 654 cases, collated from various authors, from Mauriceau to the present day, in which the treatment consisted of turning, &c., the child being extracted before the placenta. This he contrasts with another table of 141 cases in which the placenta was removed or expelled before the child. In the 654 cases, 180 mothers, or 1 in $3\frac{6}{10}$, were lost. In the 141 cases, the maternal mortality was 10, or only 1 in 14, which apparently gives a very large balance in favour of the extraction of the placenta before the child. But as it has been argued by Dr. Barnes, we cannot fairly suppose cases in which the placenta is extracted artificially, will prove as favourable as those in which it has been detached and expelled without assistance. The cases in which the placenta is expelled by the natural efforts are those in which the pains are powerful, the placenta being expelled suddenly, and the child speedily born. In the case of artificial detachment and extraction, little or no assistance from the uterus can be reckoned on. The difference is very great between the spontaneous separation and expulsion and the artificial detachment and extraction of the placenta. The published cases of extraction of the placenta are too few to found upon them any precise conclusions; and it must also be remembered that the advocates of any novel mode of practice are more prone to publish successful than unsuccessful cases. The statistics of Dr. Radford, of cases in which the placenta was removed by the hand, are, it must be mentioned, not so favourable, as regards the mother, as those of Dr. Simpson. There is little doubt that in many of the cases of supposed detachment of the placenta, when the placenta was not extracted, the detachment was only partial in character. This is evidently true of some of the cases published by Dr. Trask and other authors.

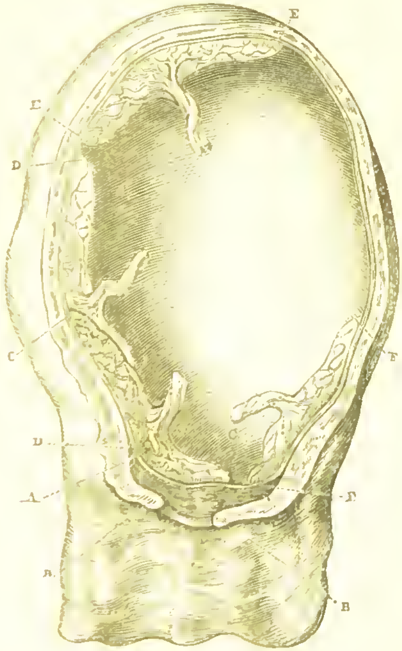
By the ordinary methods of practice, rather more than half the children are lost; and Dr. Simpson attempts to show that the mortality is scarcely more than this when the placenta was extracted before the child. He gives a table of 141 cases, of these the child was saved in 33 cases; in 79 cases it was born dead; in 1 the child was anencephalous, and died shortly after birth; in 28 cases, the result, as regards the child, was not stated. But such a state of mortality cannot be hoped for from artificial extraction. In many of the cases of spontaneous expulsion, the fœtus, membranes, and placenta are expelled by the same pain. Dr. Simpson, as Dr. Fleetwood Churchill observes, has only recorded one case of the child being born alive when the interval after the removal of the placenta was more than ten minutes. Dr. West collected 17 cases; but in 16 of them the children were lost. If this great proportion of fœtal mortality should be preserved, it must go far to prevent the adoption of extraction in any but the most unpromising cases.

Dr. Barnes has entered more fully than any previous author into the subject of placenta prævia and its treatment. He believes that in placenta centralis the action of the pains detaches the placenta in concentric rings from below upwards, until the separation is carried sufficiently high to admit of the passage of the fœtal head. This point being reached, he contends that the hæmorrhage ceases, although a sufficient amount of placenta may remain attached to allow of the preservation of the child. In placenta lateralis, also, cases are met with in which no interference takes place, but in which the placenta is detached from the os uteri and from the internal surface of the uterus to a certain extent, after which there is no further hæmorrhage. Thus there is a zone or line round the lower part of the uterine cavity, above which the placenta is tolerably safe against detachment during delivery, and below which separation and hæmorrhage are inevitable. Dr. Barnes founds upon these data the principle of practice for which he contends—namely, the artificial separation of the placenta, when the os is sufficiently open, to such a distance above the os uteri as to admit of the passage of the fœtal head, and thus save the patient from the intermittent separation and hæmorrhage produced by the pains. He would effect at once, by passing one or two fingers into the uterus, rupturing the membranes, and sweeping them round the os and cervix, what Nature only does slowly and dangerously, believing that the natural contractions of the uterine tissue will prevent any dangerous effusion of blood after this operation, or that, if uterine action be wanting, it may be compensated for by internal and external stimuli, plugging the vagina, the administration of ergot, astringent injections, or the use of electricity. When the detachment of the placenta has been completed to the extent pointed out, Dr. Barnes would, as I understand him, leave the case to nature, unless special reasons for other interference should exist. Dr. Cohen, of Hamburg, has proposed, in cases of partial or lateral placenta prævia, to detach entirely the placenta from that half of the cervix to which the smaller portion of its bulk is attached, when, as he states, the placenta passes over during the pains to the side of its chief attachment, and the hæmorrhage ceases. Dr. Cohen mentions that he has, in many instances, performed this operation with invariable success as regards the mother, and that he has rarely lost a child. This method is evidently an ingenious modification of that proposed by Dr. Barnes. As regards the use of astringents, Dr. Barnes recommends the sesquichloride of iron, or a pared lemon, but I would suggest the use of alum iron as a more powerful astringent. In the application of pressure, an inflated air pessary of sufficient size would be more effective than any other kind of plugging. As a summary of the whole of this important subject, it may be stated that:—

In turning, we have the great advantage of controlling the duration of labour, and in the performance of the operation the hand and arm of the accoucheur, and subsequently the part of the child brought down, plug the cervix uteri very efficiently. I believe also, that, except in cases of limited attachment of the placenta at the os uteri, the chances of saving the child is as great as by any other method. The risk to the mother from the operation, unless in extreme cases, is very slight. Turning cannot, however, be practised until the os uteri is dilated to a certain extent, up to which time plugging must be depended on if we determine to turn. Cases are also sometimes met with in which the exhaustion of the patient is so extreme as to forbid the operation.

In Separation and Extraction of the placenta we have the means of arresting the flooding when the mother is too weak to admit of turning. Hæmorrhage does not, however, invariably cease on the extraction of the placenta, and by this procedure the life of the child is almost certainly sacrificed. The best cases for its performance are those in which dangerous exhaustion exists, or when the child is already dead.

Fig. 130.



Varieties of placental attachment.

E, E. Fundal placenta.
D, D. Lateral placenta.
F, F. / C, B. } Latero-cervical placenta.
A, B. / B, F. } Seat of cervico-orificial, or central placenta.
A. / E. } Line of boundary between normal and prævial placental attachment, and consequently of spontaneous placental detachment, during expansion of cervix.

In Partial Detachment of the Placenta, there is a fair chance of saving both mother and child in favourable cases.

But although I give its full value to the principle enunciated by Dr. Barnes, it must in practice be difficult to know, in individual cases, at what point of detachment the hæmorrhage is certain to cease altogether, it being the great feature of hæmorrhage in placenta prævia, that it suddenly ceases and as suddenly recurs. I should myself prefer to combine turning with the mode of practice advocated by Dr. Barnes.

The danger as regards the mother, in placenta prævia, arises chiefly from the direct or secondary effects of loss of blood, and from injuries done to the passages by operative proceedings. Dr. Tyler, of Dublin, has related a case, in which traumatic tetanus followed upon placenta prævia. Uterine phlebitis is frequently met with after placenta prævia in cases where the patient survives delivery. Out of 64 cases, Dr. Lee records that phlebitis occurred in six cases. As phlebitis occurs in cases where turning has not been performed, or where the operation gave little or no pain, it is probable that the tendency to disease of the veins may be caused by their being bathed in the uterine discharges as they pass the os and cervix uteri. The special dangers to the child arise from asphyxia, the result of the flooding or pressure, on the cord in turning, &c.

CHAPTER XXXI.

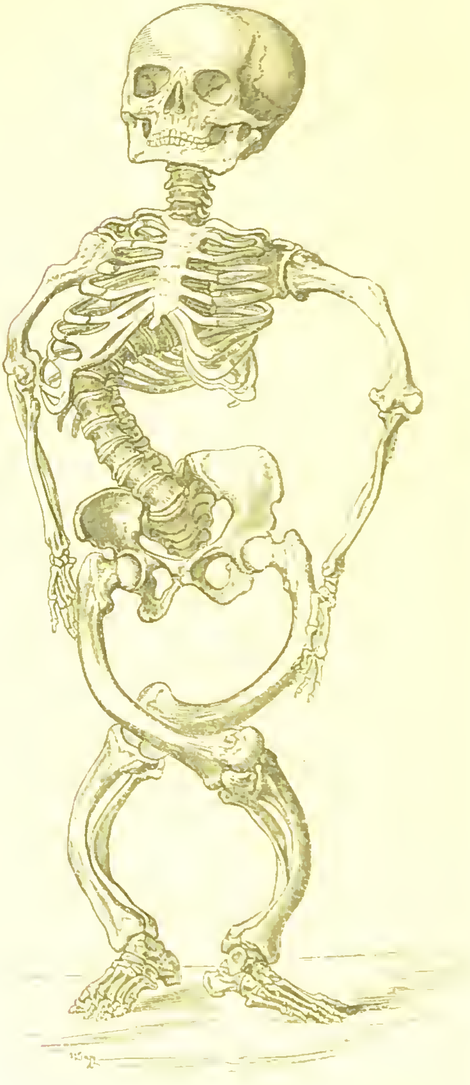
DEFORMITIES OF THE PELVIS.

Distortions of the pelvis are amongst the most serious dangers which await the parturient female and her unborn offspring. The severer forms of deformity are comparatively rare, but slighter deviations come under our observation pretty frequently, especially in highly-civilized, over-crowded, and ill-fed populations. In the case of minor deformities, or alterations of dimension to a slight extent, it is, in most instances, the child only which suffers. As obstetricians have gradually improved themselves in the diagnosis of pelvic deviations, it has become customary to resort to operative procedures at an earlier stage of labour than formerly, and thus much unnecessary pain and risk have been saved to mothers. Graver forms of distortion of course involve operations attended with much risk to the parent. Hysterotomy, in this country at least, has had a very fatal history; and when the pelvis is greatly contracted, evisceration and piecemeal extraction of the fœtus is a protracted and extremely dangerous operation. The best safeguard against errors of practice, whether they consist of premature efforts to deliver, or of timorous delays, is to be found in an exact knowledge of what deviations may present themselves; how they may be recognised; how their extent may be determined approximately; and what influence they are likely to exert upon the progress of labour, so that, if necessary, dangers may be averted by the induction of premature delivery.

The conventional phrase, "deformities of the pelvis," must be held to imply something more than its etymology contains. By it we understand all deviations from the standard size and form, of whatever nature they may be, and however they may have been effected. Many attempts have been made to treat the subject of pelvic deviations systematically. Some writers have classified them according to the degree of distortion, and others according to the kind of distortion; but it is impossible to arrange them together in the same satisfactory manner as a naturalist groups plants and animals. It is better to dispose of the different deformities met with one by one, to indicate their pathological and mechanical relations, to point out how they may be recognised, and afterwards to subjoin such practical conclusions as may seem most warranted by the accumulated experience of the past. An immense variety of deviations from the natural size and form of the pelvis have been met with:—contractions of the brim, cavity, and outlet, in various directions, caused either by disease, tumours, or fractures; arrest of development, which gives us a pelvis of the infantile type; equable enlargement and equable contraction; the masculine type of pelvis; funnel-shaped pelvis; flatness of the sacrum; and oblique distortion of the pelvis, &c.

The most important pelvic deformities, perhaps, with which we are acquainted, are those which arise from Rachitis, or from Malacosteon. In the first of these diseases, distortion is produced during infancy, or at least some period anterior to puberty, and affects the pelvis in common with all the bony structures of the body (Fig. 131); malacosteon, or osteomalakia, on the contrary, is a disease of adult life. The effects produced by each of these diseases are, of course, somewhat different, although in both cases there is softening and distortion of bone, and both are in their nature inflamma-

FIG. 131.

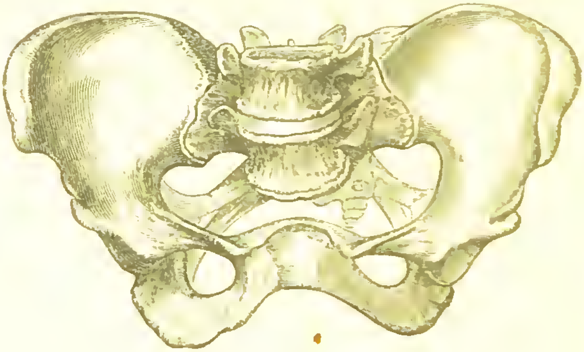


Skeleton of a rachitic dwarf with contracted pelvis.

tory. The mechanical relations of the adult and infantile pelvis are somewhat different—the width of the infantile pelvis is less in proportion to the height of the individual, than after puberty; the obliquity of the pelvis is much greater, and the heads of the thigh bones are thus in every way brought nearer to the line of gravity. The softening which takes place in malacosteon is more equable than that of rachitis—that is to say, the whole structure of a bone is similarly invaded by it, while in rickets the alteration of intimate structure affects particular portions of a bone; and, except in extreme cases, leaves comparatively solid osseous districts, which take little or no share in the torsion produced. In accordance with these facts, it will be found that rickety pelves are liable to one special kind of distortion, and malacosteon pelves to another. In the first case, the deformity produced is generally of the elliptical variety, the sacro-pubic diameter being decreased, and the lateral very much increased relatively, and sometimes absolutely. In malacosteon, on the other hand, a reversed condition obtains—the deformity is angular, the pelvis is rostrated or beaked, the sacro-pubic diameter is increased relatively to the transverse, and the transverse diameter diminished absolutely. In rachitis, the deformity takes place in early life, when the entire ossification of the pelvis is incomplete, and the pelvis gives way from the pressure of the body upon the sacrum. In malacosteon, the deformity takes place after maturity; and is caused by the pressure applied to the acetabula by the thigh bones. In one case, the pelvis is flattened from above downwards; in the other, it is compressed from side to side. This statement, however, must only be taken as a general one; for there are cases on record which show incontestably that the angular variety of distortion may take place as a result of rickets. A most remarkable case is recorded by Naegelé, in which all the characters of the osteo-malacious pelvis obtained; but there was not the slightest doubt that the disease which produced the deformity was rickets. The same authority observed two other cases, which contradicts the established belief that rachitis is not productive of angular deformity of the pelvis; and he refers to several other cases collected by competent observers. Stoltz communicated to him the cases of two children, of the ages of one and eight years respectively, in whom, although rickets had been undoubtedly the disease, yet the pelves were altogether of the form generally supposed to be peculiar to osteo-malakia. Otto, Wallach, and Von Krumbholz, mention exactly similar cases; and Burns admits the existence of angular deformity in connexion with rickets. An oblong deformity of the pelvis is sometimes met with where there is a backward curvature of the spine. In this case, the sacro-pubic diameter of the brim is very much increased; the antero-posterior diameter of the outlet is proportionately decreased, but not always.

The accompanying engravings are illustrations of characteristic specimens of rickety and malacosteon pelves respectively:—

Fig. 132.

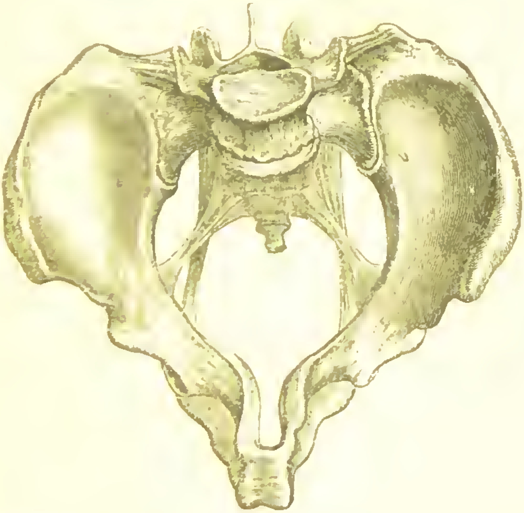


Pelvis deformed by rachitis.

Fig. 132 is a representation of a ricketty pelvis affected with the usual ovate deformity. The sacrum in such cases is placed more horizontally than natural; the promontory projects forwards and sinks, as it were, into the cavity of the pelvis, so as to bring the fourth or fifth lumbar vertebra into the position naturally occupied by itself. The sacrum is somewhat diminished in depth, though not so much so as in the case of malacosteon distortion; its vertical and lateral curvatures are both diminished, and the bone is consequently very much flattened. The apex of the sacrum and the coccyx are bent acutely forwards and inwards. The wings of the iliac bones are somewhat flattened and everted, and carried bodily forwards towards the anterior part of the pelvis. The symphysis pubis is sometimes projected inwards, so as to give the inlet of the pelvis an hour-glass shape. The tuberosities of the ischia are separated so as to increase both the transverse diameter of the outlet and the width of the sub-pubic arch.

Figs. 133—136 are specimens of malacosteon pelves. They are specimens of the oblong rostrated variety. Figs. 135 and 136 are representations of the pelvis of the celebrated Isabella Redman, seen from above and below. The general effects produced in malacosteon are, narrowing of all the diameters of the pelvis, but especially of the transverse, whether of the brim, cavity, or outlet. The antero-posterior diameter of the brim, or rather the distance from the promontory of the sacrum to the symphysis pubis, is, relatively to the transverse diameter, very much increased; absolutely, it is somewhat less than natural. The pubic arch is very much narrowed. The tuberosities of the ischia are approximated. The sacrum is very much incurvated, and the acetabula are much closer together than in the normal pelvis. The ilia, instead of being carried bodily forwards as in the rickety pelvis, are folded up, and the iliac fossa is made to resemble an oblique furrow running from above downwards.

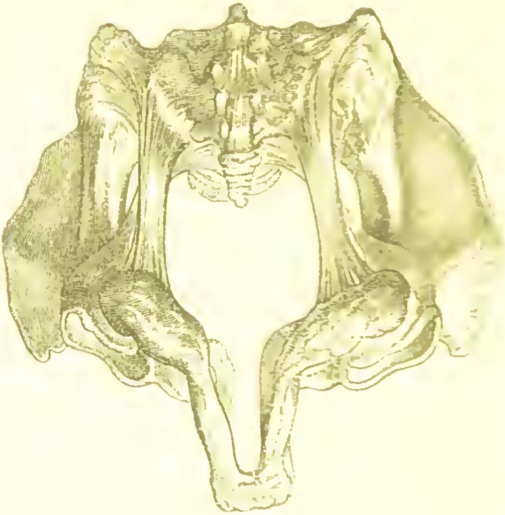
FIG. 133.



Rostrated variety of malacosteon pelvis, seen from the brim.

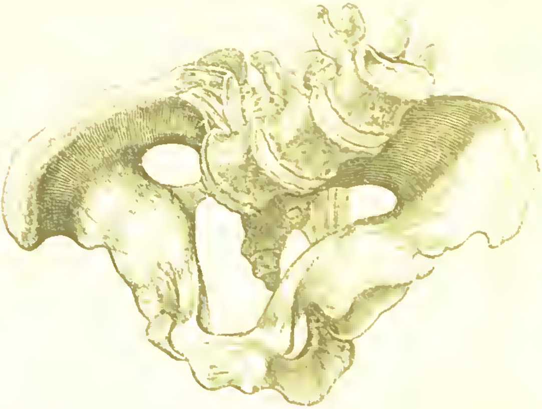
Dr. Herman Meyer, of Zurich, has elucidated the difference between rickety and malacosteon pelves most admirably in some researches, an able account of which, by Dr. Matthews

FIG. 134.



Rostrated malacosteon pelvis, as seen from the outlet.

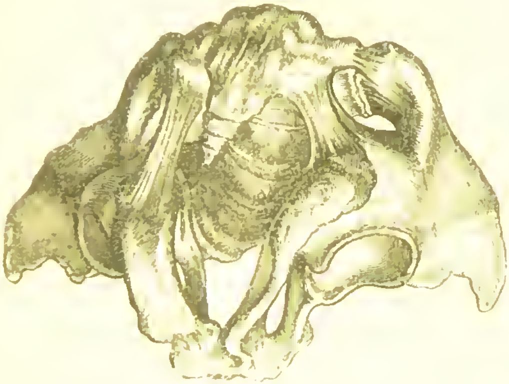
FIG. 135.



Malacosteon pelvis in extreme deformity, seen from the brim.

Duncan, is contained in the "Edinburgh Medical Journal" for April, 1856. Numerous diagrams are given by him, which

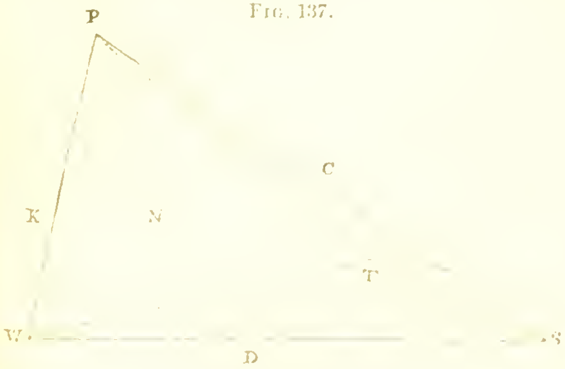
FIG. 136.



The same malacosteon pelvis, seen from the outlet.

convey more distinctly to the mind the nature of the deformities they are intended to illustrate than any merely written description. Some of these are copied in the following outlines, and others are modified with a view to their simplification. In the first place, profile sections of the pelvis are given, or rather of that part of the true pelvis which is above the middle of the third piece of the sacrum. The superior

FIG. 137.

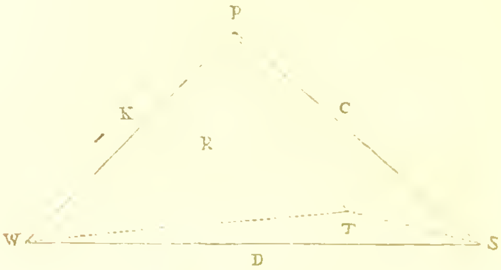


Profile section of natural pelvis.

plane of the pelvis is considered as divisible into two parts, one posterior and another anterior, separated from each other by a line drawn across the pelvis from one ileo-pectineal eminence to another.

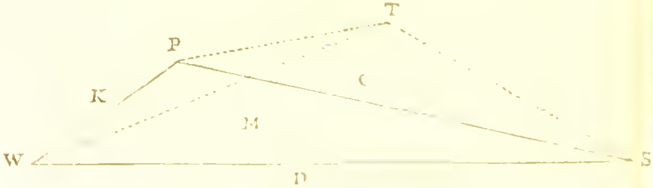
The same letters apply to each figure, except that N is a section of the normal pelvis, R of the rickety pelvis, and M of the malacosteon pelvis. K is a line drawn from the promontory of the sacrum (P) to the middle of the third piece of the sacrum (W). C is the sacro-pubic diameter of the brim; S is the upper part of the symphysis pubis; D is a diagonal diameter joining S and W; T is the point in the vertical plane (P W S), traversed by the horizontal line, which joins the ileo-pectineal eminences: in the malacosteon pelvis, this point is, however, beyond the plane. The dotted lines, T

FIG. 138.



Profile section of rickety pelvis.

FIG. 139.

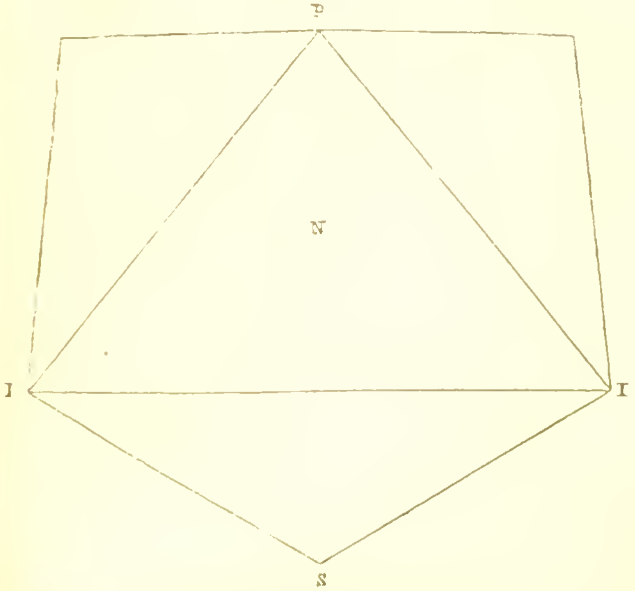


Profile section of malacosteon pelvis.

T S, show the relations of the two halves of the plane of th brim to each other; and the line T W shows the relation of the middle of the ilio-pectineal line to the third piece of the sacrum. The distance between T and C in each case helps to illustrate the nature of the ilio-pubic angle. The following table will show the measurements in each case, and develope their essential differences :—

	Normal Pelvis. Millimètres.		Rickety Pelvis. Millimètres.		Malacosteon Pelvis. Millimètres.
Length of the line C	118	...	74	...	104
,, K	68	...	66	...	38
,, D	112	...	104	...	134
,, T P	78	...	50	...	49
,, T S	40	...	28	...	62
,, T W	Nearly the same in each variety.				
The distance of T below C	3	...	11·5	...	0
The distance of T above C	0	...	0	...	18

FIG. 140.

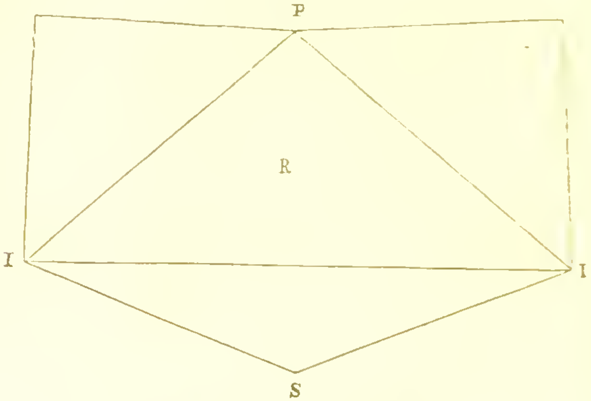


Transverse section of normal pelvis.

"From these measurements," Dr. Duncan observes, "it is evident that the two halves of the plane of the brim, which, in the normal pelvis, are almost directly continuous, form with one another, in the rickety pelvis, an angle open above, and in the malaeosteon pelvis, an angle open below—in both cases of about 141°."

The three varieties of pelvis are still further elucidated by studying transverse or horizontal sections. The two halves of the plane of the brim are now regarded as continuous.

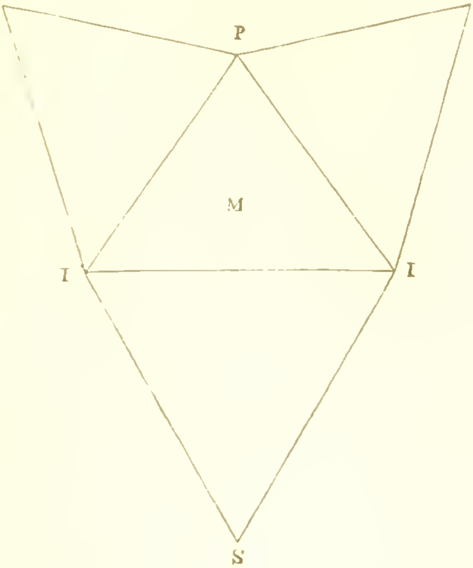
FIG. 141.



Transverse section of rachitic pelvis.

As before, N is the normal, R the rickety, and M the malaeosteon pelvis; P is the promontory of the sacrum in each case; S is the symphysis pubis: I I are the ilio-pectineal eminences, joined by the line which cuts the vertical plane (P W S) in the first series of figures, at the point T; and P I I are triangles constructed upon this line. Comparing these triangles, it will be seen at once that the base is very much the same, whether the pelvis be normal or rickety, but that in the latter the apex has approached the base to a considerable extent. In the malaeosteon pelvis, the points P I I have all approached each other very much, and the triangle included by the lines which join these points is much smaller than in either of the other pelves. These sections illustrate also the rostrated form of the anterior half of the pelvis, and the folding of the iliac wings in malacosteon; they also indicate the sinking forward *en masse* of the ilia, which was spoken of before as taking place in rickets. It is almost unnecessary to add anything more in the way of illustration; the preceding diagrams almost explain themselves.

FIG. 142.



Transverse section of malacosteon pelvis.

The pathology of the diseases which result in the two foregoing species of deformity is of considerable interest. There are many points of analogy between the intimate conditions of the bones in each case, but there are variations in the details which affect the progress, terminations, and alliances of the morbid conditions. As a general statement, however, it may be said, that both in the case of rachitis and osteo-malakia the morbid processes partake very much of the nature of inflammation.

Rachitis may be divided into three distinct periods. The first is one of rarefaction, as it is called by French pathologists; or, in other words, the structure of the bone opens up.

In the second period, there is something deposited, and hence this has been called the period of organization. If the disease tends towards recovery, the third stage, or period of consolidation, is established; if, on the other hand, the morbid processes are pushed on to their final developments, destruction of osseous tissue is in a great measure consummated, and the subject of the disease perishes either by hectic fever, marasmus, or some intercurrent disease, such as pneumonia or diarrhœa. There is generally tubercular deposit in the organ affected. In the first stage of the disease, the bones preserve their normal form and direction, but their consistence is somewhat diminished, and they are more elastic. The periosteum becomes much more vascular, is thickened, and adheres to the bone more closely than natural. On stripping off the periosteum, the bone will be found moist, uneven, and destitute of its usual smooth aspect. Between the surface of the bone and the periosteum, there is a deposit of gelatinous, pinkish matter. Upon examining the exterior of the bone with a glass of small magnifying power, after this matter has been washed off, the Haversian canals will be seen to be much more distinct and of greater calibre than natural, and they are filled with the gelatinous material. When first effused, this is more fluid, and it only assumes the gelatinous condition after a certain time. M. Guerin has examined this deposit microscopically, and says that after the exudation in question has become gelatinized, organization takes place, somewhat after the manner of false membranes, and that myriads of small vessels may be distinguished crossing each other, and forming an inextricable web. The changes which occur in the bones are more pronounced in long than in flat bones, and are still more remarkable in the epiphyses than in the shafts. In all bones, however, and throughout the whole structure of each bone, the areoles are widened, the structure is loosened, and a slight increase of volume takes place. The medullary canal, as well as the interspaces between the solid elements of the bones, are filled with the sanguinolent, greasy matter referred to above; the colour has been compared to that of currant-jelly. The precise spot at which the histological changes referred to are most prominently developed is, however, just where the shaft and epiphysis of the bones join, or in that portion of cartilage which is undergoing osseous transformation. The flat bones become somewhat swollen.

Thus the phenomena of this period are—first, vascularization of the bone and periosteum; secondly, slight swelling of the epiphyses and flat bones; thirdly, opening up of the osseous tissue, due to effusion of the sanguinolent matter, and absorption of the calcareous particles of the bones; and fourthly, softening of the bone, diminution of specific gravity, acquisition of unnatural elasticity, and the first indications of yielding to pressure. The second stage of the disease is marked by a still greater increase of volume, especially towards the extremities in long bones; this is more apparent than real, nevertheless, it is not correct to attribute the whole of the apparent increment of the epiphyses to atrophy of the muscles, above and below the articulations. The bones now begin to curve and yield to pressure in a very marked manner. Some of the curvatures are the result of the weight of the body itself; others are the result of muscular action, and the habitual posture of the child will materially affect the character of the distortions, especially about the pelvis. The vascularity and softening of the bones, and the opening up of the lamellæ, keep pace with the continued effusion which obtains as the disease advances. The effused matter, wherever it is poured out, becomes adherent to the surfaces with which it is in contact, and is transformed, especially towards the extremities of the bones, into a reticular, elastic, reddish tissue, like a fine sponge. It is curious to observe that the convex aspect of the bones differs very much from the concave; that it is somewhat granulated, and is sonorous when struck. The concave surface, on the contrary, is of the consistence of cartilage, or of a bone softened in acid. The touch, as well as inspection, reveals a totally different composition, and a dense but soft and elastic tissue may be recognised adhering intimately to the under surface of the periosteum; this tissue is thick on the concave surface of the bone, but is insensibly lost on the lateral aspects. The calibre of the medullary canals is considerably diminished. If the disease tends towards recovery, absorption of the calcareous portions of the bones is reduced within natural limits, and solidification takes place. The reticular tissue becomes dense, and spiculæ of bone are found in it; the lamellæ thicken, and ossification is carried on with great vigour. Towards the extremities of long bones the adventitious reticular tissue is in a great measure re-absorbed. Now, the curvatures of the bones diminish to a certain extent, but this depends upon their degree, intensity, and the development of the subject of the disease; if the curves have not been very great, and reparation occurs early, very little trace may be left of the disease, but opposite conditions can hardly fail to result in permanent deformity. Should the disease pass on to its most untoward termination, osseous structure is almost entirely destroyed, and the intimate condition of the skeleton is very similar to that which obtains in osteo-malakia. M. Guerin has named this condition "rachitic consumption." A most elaborate account of the pathology both of rickets and osteo-malakia is to be found in M. Beylard's work on these subjects, recently published, of some parts of which the foregoing details are an abridgment.

The following rough analysis of the constituents of bones in rachitis, as compared with the normal state, will indicate as clearly as possible the nature of the organic defect which results in torsion and fracture :—

Rachitis—	Organic matter.	Inorganic matter.	Total.
Rokitansky	81	19	100
Davy	74	26	100
Bostock	80	20	100
Normal bone in the child—			
Schreger	50	50	100

Osteo-malakia would appear to occur in two forms. In one, fragility of the bones is most apparent; in the other, softening. In the first variety, numerous and repeated fractures occur in nearly all the long bones; in the second, distortion is the characteristic result. Syphilis, cancer, and a rheumatic diathesis, have each and all been claimed by various writers as allied diseases to the one in question. There is no doubt that great fragility of the bones occurs in the advanced stages of cancer, and sometimes also in syphilis when it has become constitutional, but it can hardly be said that mollities ossium, properly so called, has any special relations with other constitutional *diseases*: if any one condition is more constantly related to it than another, it is perhaps that of utero-gestation frequently repeated. In every gestation the system of the mother has to part with a large quantity of osseous matter for the development of the fœtus. The simple mollities ossium appears to be more like advanced infantile rickets, while fragilitus ossium is, according to Mr. Paget, a true fatty degeneration of bone. The worst cases of the disease are ushered in by acute pains all over the body; the urine is loaded with a whitish deposit (phosphatic), and a general cachexia appears to have invaded and taken possession of the system. As a general rule, the disease is fatal after repeated fractures of the bones have taken place, or the skeleton has become strangely distorted. The familiar engraving of Madame Supiot illustrates the extent to which the bones will yield in extreme cases. The rule as to fatality, however, is not an absolute one; for Naegelé relates a most remarkable case of a woman who had six healthy living children at the full period; between her sixth and seventh labours she became the subject of malacosteon, and such distortion of the pelvis took place that delivery had to be effected by the Cæsarian operation; the patient died. The most remarkable point in the case was that the pelvis had regained its natural density. Thus death was the result of the operation for delivery, and there is no reason to doubt that the woman would have entirely recovered had pregnancy not taken place, or the operation been rendered necessary by the previous distortion. When the disease occurs in women who are breeding, it is frequently progressive, increasing with each pregnancy. In a case reported by Dr. Cooper in the fifth volume of "Medical Observations and Enquiries," the deformity increased in such a manner as to reduce the sacro-pubic diameter of the pelvis to an inch and a quarter in the last pregnancy; the Cæsarian operation was performed, and the patient died. Barlow reports eight analogous cases in his Essays. The effects produced upon the bones in the form of disease under consideration are, alterations of form, weight, and consistence, and to these may be added fractures and alterations of the intimate structure of the bone. A brief sketch of these particulars will suffice. The alterations in form are infinitely various according to the intensity of the malady, the action of the various muscles attached to the bones, the use made of the limbs by the sufferer, the positions habitually assumed, and sometimes modifications are produced by supporting their apparatuses. Long bones curve at first in the direction of the normal flexures and at their weakest points; in a more advanced stage they assume **S**- or **Z**-shaped irregularities of form. Flat bones fold up, as it were, and are also compressed by superincumbent weight. Fractures take place generally in a transverse direction in long bones, and, as the force applied is comparatively feeble, the periosteum does not necessarily rupture. M. Buisson met with a case in which there was an immense number of fractures, sixty-three; nearly all were more or less undergoing reunion. Wilson has observed that in the same subject some fractures unite, while others take on hardly any reparative action; false joints sometimes result from these ununited fractures. The specific gravity of bone is very much diminished in this disease, not only by the removal of a large quantity of earthy matter, but by the superaddition of a quantity of fat, amongst which are the ordinary fat of the human body and crystals of margarine separately aggregated together. Healthy adult bone has a specific gravity of from 1·97 to 1·87. Rokitansky gives ·721 as the specific gravity of bone in a case of mollities. Chemical analysis shows an enormous diminution of earthy matter. The two following analyses are by Berzelius and Rokitansky respectively:—

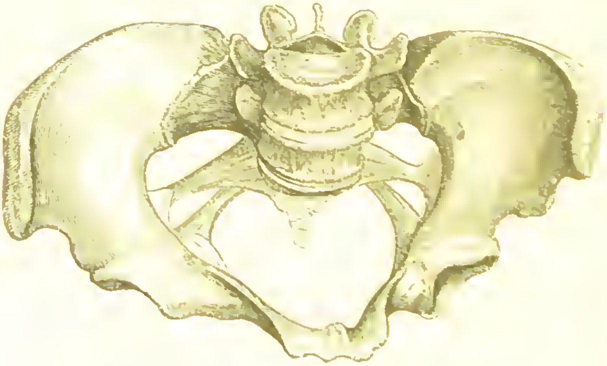
	Animal matter.	Inorganic matter.	Total.
Healthy adult bone	33·30	66·70	100
Bone affected with mollities ...	76·20	23·80	100

In Mr. Wood's article on the Pelvis, in the "Cyclopædia of Anatomy and Physiology," there is a table of the respective amounts of earthy matter in various parts of the skeleton; and he has pointed out a fact which is very interesting—viz., that of the bones of the pelvis, the pubis is that which loses most of its earthy constituents in malacosteon. This accounts, he says, for the rostrated form of the pelvis in certain cases. The intimate changes which take place are very analogous to the more advanced stages of infantile rachitis. Some variation occurs according to the kind of mollities. In general, it may be stated, that the periosteum is preternaturally vascular, thickened, and easily detached; it draws its prolongations into the Haversian canals along with it when detached, and sometimes spiculæ, or granules of bone, adhere to it. At other times, the periosteum is very adherent; and, again, it is encrusted, as it were, on its inner surface, with a thin lamina of bone, which constitutes all that remains of the skeleton. In the case of Madame Supiot it was quite natural, notwithstanding the extremity to which the disease had advanced. The variable accounts given of the state of the periosteum may perhaps depend upon the different stages of the disease attained in the different specimens reported upon. The bone itself undergoes various changes, caused by an effusion of gelatinous matter, like that poured out in rachitis. This occupies the Haversian canals, and the medullary canal also; and as the lamellar structure is opened up, occupies the spaces between the laminæ. The areoles of the cancellated tissue are also filled with this matter; and the partitions between them are absorbed as the disease advances. A large quantity of fat is to be found in the grumous contents of the bony cylinder; and Mr. Paget is of opinion, that in a great majority of cases this quasi-gelatinous matter is indeed only disguised fat. Before the bones are reduced to this extreme point of degeneration, they may be cut with a knife, and may be even indented by the finger-nail. The laminæ, or bone corpuscles, would appear to be generally enlarged, and the canaliculi either shortened or altogether absent. Thus there is a general opening up of the structure of the bone, a vascularization and thickening of periosteum, and an effusion of adventitious matter, as in rachitis. The differences would appear to be in the occasional absence of anything abnormal in the periosteum, in the extremely fatty nature of the effusion, the absence of that fibroid organization by which the bone is supplemented, as it were, in rachitis, in the disease attacking all parts of a bone at once, and, finally, in there being, in a great many cases, some constitutional cachexia, or cause of debilitation.

Another interesting and important variety of pelvic deformity, distinct from the deformity caused by rachitis or malacosteon, is the Obliquely Distorted Pelvis, first described by Naegelé.

This eminent observer published a most laborious memoir upon the obliquely distorted pelvis, in which he described most accurately and minutely no less than thirty-seven pelves affected with this malformation. Those who desire to study the deformity will find an excellent translation of the original work, by Dr. Christie, of Aberdeen. It will, of course, be impossible to follow Naegelé throughout his laborious dissertation. We must be contented with reviewing the general characters of the obliquely distorted pelvis, pointing out the diagnosis of it in the living subject, and considering what influence it may have upon labour, and what are the pathological or other conditions out of which it arises. The following characters then are general: 1. Anchylosis, or rather fusion, of the sacrum with one or other of the iliac bones. 2. Imperfect development of that lateral half of the sacrum which is fused with the adjoining iliac bone. 3. Narrowing of the os innominatum, and diminished width of the great sacro-sciatic notch on that side on which the anchylosis or fusion exists. 4. Deflexion of the whole sacrum towards the anchylosed side, and turning of the anterior surface of this bone in the same direction. 5. Displacement of the symphysis pubis towards the opposite side to that on which the sacro-iliac fusion obtains. 6. Diminished excavation of the inner surface of that lateral half of the pelvis which is on the same side as the anchylosis. 7. Diminished curvature of the posterior half of the linea ilio-pectinea on the side opposite to the anchylosis, and increased curvature of its anterior half. 8. Increase of that oblique diameter which extends from the anchylosis to the acetabulum of the other side, and diminution of the remaining oblique diameter. 9. The distance of the promontory of the sacrum from the acetabulum, on the anchylosed side, is much less than the same measurement on the opposite side; and the same is true of lines drawn from the promontory of the sacrum to either ischial spine. 10. Convergence of the walls of the pelvis inferiorly, approximation of the spines of the ischia, and narrowing of the sub-pubic arch. 11. A vertical plane, coinciding with the sacro-pubic diameter of the pelvis, does not correspond with the

FIG. 143.

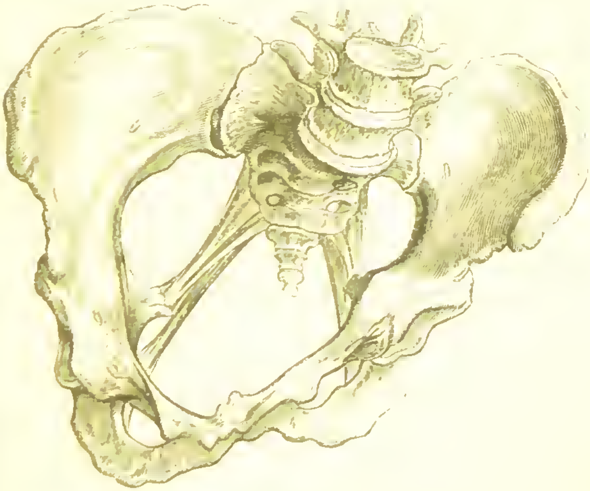


Pelvis obliquely distorted to a moderate degree.

mesial plane of the body, but is deflected so as to make an angle, with a vertical transverse plane joining it posteriorly, greater than a right angle on the anchylosed side, and less than a right angle on the opposite side. (Figs. 143 and 144.)

The diagnosis of an obliquely-distorted pelvis is not particularly difficult, now that we are in possession of such exact information as to the nature of the deviation. Notwithstanding this circumstance, such a distortion, unless very much exaggerated, is extremely liable to be overlooked. The subjects of this deformity are, generally speaking, well-shaped in other respects: there is no very striking diminution of their breadth across the pelvis; they are as active as other people; and there is, in fact, nothing to call attention to them, until obstructed labour reveals the condition of their pelves; always provided, as before mentioned, that the deformity is not extreme. The gait is affected when much distortion obtains. Should any suspicion of this distortion arise, we may seek for information in three ways: first, by vaginal examination; secondly, by external measurements with Baudelocque's "compas d'épaisseur;" and thirdly, by letting fall certain vertical

FIG. 144.



Pelvis obliquely distorted to a great extent.

lines from points of the surface of the body, whilst it is in the erect posture. Vaginal examination will perhaps yield less information than either of the other means of exploration. The promontory of the sacrum is generally pretty well out of reach; the cavity appears roomy enough; and the narrowing of the sub-pubic arch and convergence of the parietes of the pelvis inferiorly, are not sufficiently pronounced to be readily appreciated by the *toucher*. More reliance may be placed on external measurements, taken from certain easily recognised osseous points, to other similar ones, generally on the other side of the pelvis. From the description given before of the general characters of the kind of pelvis under consideration, it will be seen at once that the following rules are merely corollaries of the statements made then.

The following distances should be taken and compared:—

1. From the tuberosity of the ischium on one side, to the posterior superior spinous process of the ilium on the other side.

2. From the anterior superior spinous process of one side, to the posterior superior spinous process of the other side.

3. From the spinous process of the last lumbar vertebra, to the anterior superior spinous process of each ilium.

4. From the trochanter major of one side, to the superior posterior spinous process of the ilium on the other side.

5. From the symphysis pubis, to the superior posterior spinous process of each ilium.

It is quite unnecessary to state what are the normal measurements of each of these distances; the significant fact is their relative length. If there is any very marked difference between the corresponding measurements—say, on an average, half an inch to an inch—there is reason to suspect oblique distortion; and the side on which the anchylosis is may be determined by bearing in mind the following short rule—viz., that in measurements 1, 2, 4, and 5, the *posterior* extremity of that measurement which exceeds its fellow is on the side of the anchylosis; and in measurement 3, the *anterior* extremity of the shorter measurement is on the same side as the anchylosis. The last method of examination is, to let a plummet line fall from the symphysis pubis in front, and another from the spinous process of the last lumbar vertebra behind, the body being erect. If the pelvis be obliquely distorted, these lines will not both fall in the mesial plane of the body, and the anchylosis will be found on the opposite side to that towards which the anterior line tends.

The causes of oblique distortion have been stated to be, arrest of development, and fusion of the sacrum with the ilium, and anchylosis in consequence of inflammation of the sacro-iliac joint. Naegelé leans to that view of the case which considers the deformity as the result of an original anomaly of development, and for the following reasons:—1. Because the fusion of the sacrum with the ilium is complete, as well in reference to the internal structure of the bones as to their external condition. 2. The breadth of the os innominatum of the affected side is affected, as well as its length. 3. Synostoses of other bones occur, as original anomalies of development, and are usually accompanied by deformity. 4. The obliquely-distorted pelves are all very much like each other; and 5. Because no history of disease has ever yet been traced in a case of oblique distortion. Cases, it should be mentioned, are on record in which anchylosis is said to have occurred without producing the deformity. Before leaving the subject of pelvic deformity, I propose to enter more fully into a consideration of the causes of this peculiar malformation.

The influence exerted by oblique distortion on the progress of labour will depend upon its degree, and in part also upon the presentation of the fœtus. The most favourable presentation will be the apposition of the long diameter of the presenting part to the longest oblique diameter of the brim. Supposing the head, in a vertex case, to have entered the cavity of the pelvis, an obstacle will now be opposed both to its descent and rotation, by the approximation of the spines of the ischia to each other; and the want of space anteriorly, in that direction towards which the occiput rotates, would be a still further impediment. Emergence of the head would be opposed by the narrowing of the transverse diameter of the outlet, and by diminution of the sub-pubic arch. Naegelé considered this distortion as important as any other, because there are no circumstances indicative of deformity sufficient to arouse suspicion beforehand, because it is frequent, occurs in healthy, well-formed women, and, as far as his researches extended, had never yet been recognised in a living female, and had always proved fatal to both mother and child. Some rare cases are, however, now on record, in which a more favourable result has been obtained.

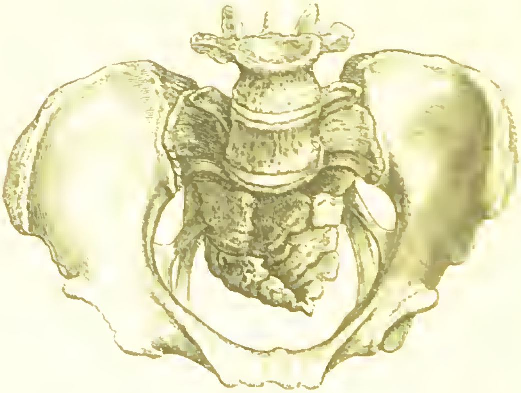
CHAPTER XXXII.

DEFORMITIES OF THE PELVIS—*continued.*

We were engaged in the last chapter with the study of the three most important deformities of the pelvis, whether considered from a mechanical or a pathological point of view. In passing on to the more subordinate deviations from the standard pelvis, it must be borne in mind, that though they may be possessed of less theoretical interest, they are equally important in relation to the practice of the obstetric art; that the same questions will be raised as to operative procedures as in the case of the deformities already described, and that they will have to be decided upon the same principles.

Exostoses and Osteo-Sarcomatous tumours, arising generally from the internal surface of the pelvis, occasionally present an insuperable obstacle to delivery at the full term *per vias naturales.* The frequency of these growths, according to some, would appear to have been very much overrated. Many cases have been put upon record as exostoses, which have not

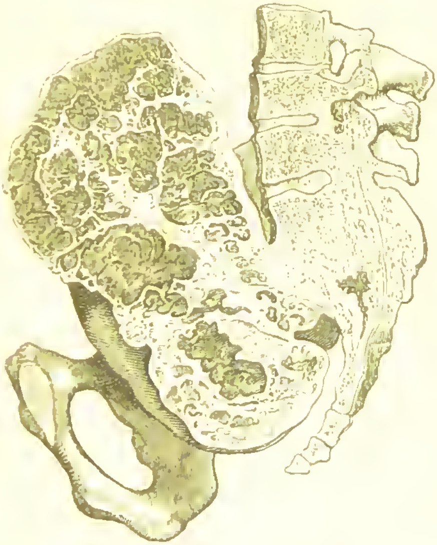
FIG. 145.



Bony growth from the sacrum.

been proved to be so by a sectio cadaveris; and the histories of others have contained particulars which mark them out as being in reality something very different to what they were conceived to be by their authors. Amongst the cases of doubtful authenticity may be mentioned one which was reported as an exostosis of the upper part of the sacrum; and, in order to effect delivery, a red-hot iron was passed up to the quasi tumour, through an earthen tube introduced into the vagina. Delivery was effected in this case, but the diagnosis was probably as incorrect as the treatment was barbarous. Projection forwards of the promontory of the sacrum has usually been the condition, without doubt, mistaken for osseous tumour of the bone. In order to establish the diagnosis of an exostosis, or other growth from the internal surface of the pelvis, it is necessary not merely to explore the cavity of the pelvis, but to compare the results of such exploration with external admeasurements, and at the same time to inquire into the previous history and collateral circumstances of the patient. The consistence of bony growths in this situation is not so markedly different from that of the bone itself, as to furnish discriminatory evidence of any value. With

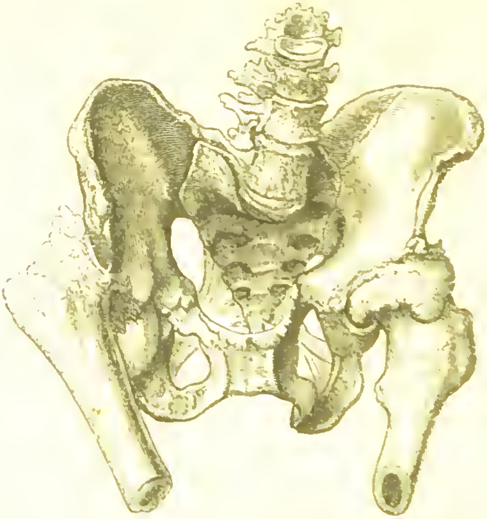
FIG. 146.



Sacral exostosis filling the pelvis.

regard to the nature of these growths, it may be stated, that they are for the most part cancellated internally, communicating with the cancellated structure of the bone from whence they spring; and externally they have a laminar wall more or less dense. Some exostoses of a denser nature, more like the ivory exostoses found on the cranial bones, have been mentioned as occurring especially in connexion with the anterior walls of the pelvis. Spiculæ of bone, too, would appear to be occasionally developed in some of those modifications of the fasciæ which constitute the ligaments of the various pelvic viscera. A connexion would appear to exist between osseous growths about the pelvis and the gouty or rheumatic diathesis. In some cases a blow has apparently been the origin of the tumour. The sacro-sciatic ligaments are sometimes partially ossified, and fibro-sarcomatous tumours at other times spring from them; the first of these abnormalities produces a pelvis like that of the Ai, or the Mylodon Robustus. The sacro-sciatic joints are the seats of some osseous projections, and, in fact, almost any joint of the inner aspect of the pelvis may be occupied by tumours of various kinds; but the upper half

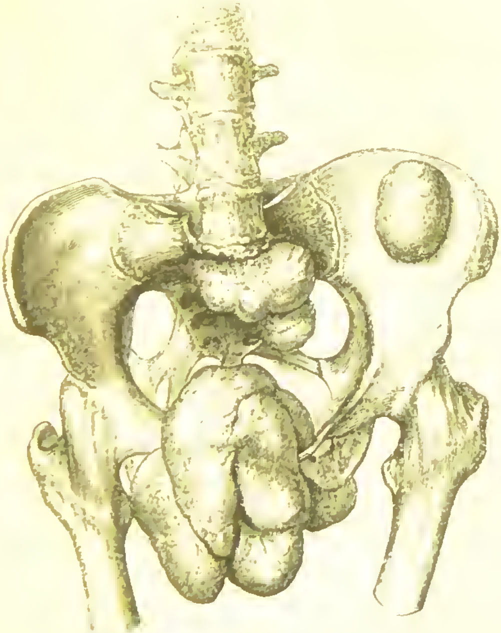
FIG. 147.



Minor degree of deformity from exostosis of the cristæ of the pubis.

of the sacrum is the *locus in quo* of the great majority. The influence exerted upon labour by these tumours is of course proportionate to the diminution they produce of the various diameters of the inlet, cavity, and outlet of the pelvis. Being in most cases incompressible, any operative procedures instituted for delivery must be the same as in the case of diminution of the bony passages arising from distortion. In some few instances tumours may be, and indeed have been, removed

FIG. 148.



Cancerous growths from the bones of the pelvis, causing deformity.

from the pelvis in the course of labour, and with perfect success; but these have been fibroid growths situated near the outlet. Occasionally it happens, in some cases of genuine exostosis, that the bony structure is so loose as to admit of being broken down during labour, either by the fœtal head or the manipulations of the accoucheur. Dr. H. F. Kilian, of Bonn, has with great ability and minuteness investigated the deformity produced by the development of spiculæ and crests of bone on the edges of the different symphyses, the superior margin of the pubis, along the linea-ilio-pectinea. These thorns or crests are simply a hypertrophy of the natural condition of the bones, but by projecting inwards they interfere with the progress of labour, and lead to rupture of the uterus by pressing upon and wounding the organ during the course of labour. Cancerous disease of the bones of the pelvis sometimes produces serious pelvic deformity. (Fig. 148.)

The Pelvis Æquibiliter Justo Minor is the next deviation from the normal standard which we have to investigate. As its name implies, this is a symmetrical pelvis smaller than natural. Three distinct varieties are met with: first, where the subject is rickety and affected with distortion of the spinal column or limbs, the pelvis being unaffected, except as regards diminution of size; secondly, the true dwarf has generally a pelvis small even in proportion to the rest of the skeleton; and thirdly, there are numerous cases of ever-varying degrees of symmetrical contraction, which appear to be wholly disconnected with any deformity or constitutional vice whatever. The last category of cases must be looked upon simply as parallel to those freaks of development which produce small heads, small hands, or small feet; probably such deviations are all hereditary. Whenever the ossific union between the different portions of the innominatum at the acetabulum is completed prematurely, the equable contraction of the pelvis is an inevitable result. When this departure from the normal standard coexists with rachitic distortion in other parts of the body, the diminution in the diameter of the pelvis is generally about one-fourth; thus the conjugate diameter of the brim would measure three instead of four inches, and other diameters would be reduced in the same ratio. Various opinions have been pronounced as to the frequency of equable contraction of the pelvis. Dr. Fleetwood Churchill believes equable enlargement to be more common than equable contraction. However this may be, it is pretty certain that diminished size of the pelvis is much oftener met with than systematic writers would have us believe. Dr. Robert Lee says, "About one-sixth of all the cases of difficult parturition which I have observed in London depended upon narrowness of the pelvis, from arrest of development, and distortion." If we eliminate from this estimate the comparatively rare cases of actual distortion, how large a number will remain to be accounted for as mere arrests of development? The experience of every practical obstetrician who is not determined to find a special distortion in every case of impactment of the fœtal head, must point to this conclusion—namely, that of those cases which require the use of the forceps for the remedy of impaction within the cavity of the pelvis, a large majority are simply instances of pelves rather smaller than natural. Many serious considerations attach to the subject of equably contracted pelves; the chances are very much in favour of its not being recognised until labour has come on, or, indeed, has made considerable progress; and even when recognised, it is extremely difficult to determine the degree of diminution, or predicate the nature of the assistance likely to be necessary. When there is an obvious distortion, these difficulties are eliminated from the question, and the special deviation stands out in bold relief, as something not to be overlooked. The nature of the impediment to delivery offered by the reduction of the size of the pelvis is of a double character: there is an obstacle to descent, and an obstacle to rotation. Bearing in mind what has been said upon former occasions as to the resemblance of the internal surface of the pelvis to a female screw, it will readily be understood that a comparatively slight contraction is sufficient to derange the intra-pelvic rotations of the fœtal head; and a slight impediment to rotation is tantamount to a vastly greater impediment to direct descent, upon obvious mechanical principles.

Allied to the Pelvis Æquabiliter Justo Minor are certain other forms of diminution, such as the Infantile Pelvis and the Masculine Pelvis. These abnormalities differ from the one just considered in possessing a special character. The infantile form of pelvis, besides being decreased as regards size, is more oblique in position; the antero-posterior diameter of the outlet is as great, if not greater, than the transverse; the arch of the pubis is narrower, the tuberosities of the ischia are approximated, and the whole pelvis is shallow. Such pelves as these are not always completely ossified; thus the several pieces of which the innominate bone is composed may still remain discrete, and the segments of the sacrum may not have coalesced. It occasionally happens that this type of abnormality co-exists with size equal to the adult pelvis. Dr. Murphy has described a pelvis of the infantile type, which was absolutely larger than the normal adult pelvis; the antero-posterior diameter in this case was five inches and a half, and the whole pelvis was perfectly ossified. The masculine pelvis is, as its name implies, one which approximates very much in dimensions and character to the pelvis of the male. Such conformations are met with in the persons of robust labouring women, in whom there is a general resemblance to the opposite sex, not only in this one particular, but in nearly all those marks which pertain to sex. It is not uncommon to see women of the lower orders, whose bones are very large, voice harsh and loud, and face coarse and hairy. The pelvis which affects the masculine type of development is rounder and smaller at the brim; the cavity is deeper, and is convergent inferiorly or funnel-shaped; the spines of the ischia project into the cavity of the pelvis; the tuberosities of the same bones are approximated; and all the eminences, processes, and ridges are more pronounced than in the standard female pelvis. An hypothesis has been put forward to the effect that this variety of formation is a hyper-ossified infantile pelvis. It must, however, be recognised simply as one of those occasional instances of convergence of the sexes with which every observing person must be familiar. Parturition will be affected much in the same way as in the infantile pelvis; if there is anchylosis of the coccyx with the sacrum or any other pelvic joints, as is sometimes the case, additional difficulty will be encountered.

The Pelvis Æquabiliter Justo Major is one in which the measurements are absolutely increased, their relative proportions being observed. Recorded instances are not very numerous, and this is obviously because women affected with this deviation are not generally the subjects of protracted or dangerous labours. It must not, however, be assumed that a very roomy pelvis is necessarily associated with very rapid or easy delivery, for it would appear that the effect upon the mechanism of labour of a too large pelvis is to a certain extent accidental. It may happen that, from a want of approximation between certain correlated diameters of the pelvis and fœtal head, those rotatory movements which conduce to natural delivery do not take place; and this applies to cases in which the pelvis is too large, as well as to cases in which it is too small. The idea of the screw may be made subservient here to a correct appreciation of what would appear, at first sight, paradoxical, if it is remembered, that unless those points of the fœtal head and the pelvis of the mother, which represent respectively the flange and worm of a male and female screw, are brought into apposition, the movement of the head through the pelvis will be one of advance simply, without any rotation: and this movement of advance may very well take place in such a manner as to bring the longest diameter of the fœtal head into relation with the shortest diameter of the outlet of the pelvis. The mechanism, then, of labour, where the pelvis is wider than natural, must be looked upon as something indeterminate and fortuitous. Should the fœtal head have the proper rotations accidentally impressed upon it, or should it gravitate into the proper position, labour will be easy and rapid, but it may in some cases be otherwise. It is very probable that those cases of unconscious or sudden delivery which are quoted in works on medical jurisprudence were to a certain extent connected with abnormal width of the pelvis. Narcotism arising from drugs or disease may abrogate consciousness during labour; but where neither of these circumstances obtain, diminished resistance on the part of the soft or bony passages must be looked to in explanation of the phenomena in question. The works of Dr. Taylor and Dr. Beck abound in cases of sudden and almost painless delivery, which can hardly be accounted for, except upon the supposition of there having been an enormously wide pelvis. Amongst the other effects of increased capacity of the pelvis upon the process of labour is, descent of the uterus while the fœtal head is still within the os uteri. Instances of this have been recorded, in which the fœtus has passed the external genital opening as far as the shoulders, the head being still closely invested by the uterus. Such a condition as this is obviously favourable to the occurrence of inversion of the uterus; and this latter may, in fact, be enumerated as one of the untoward circumstances to be apprehended in connexion with enlarged pelvis. Prolapse of the various viscera within the pelvis, and retroversion of the uterus, are conditions favoured, or likely to be induced, by the abnormality under consideration. The largest pelvis of this kind, whose dimensions have been recorded, is one described by Giles de la Tournette. The most important diameters were—

	Inches.
Antero-posterior of brim	5·5
Transverse of brim	6·5
Antero-posterior of outlet	5·5
Transverse of outlet	5·5

Dr. Barnes and Dr. Murphy have described pelves of nearly equal size. As regards the relation of increased capacity of the pelvis to the general conformation and stature of the individual, it may be stated as a general rule, that tall women are by no means likely to be the subjects of such increment; it has rather been observed that women of low stature, and with large heads, have the most capacious pelves. Some persons profess to discover a relation between the length of the phalanges of the fingers and the capacity of the pelvis, maintaining that women with curb fingers have small pelves, and *vice versâ*.

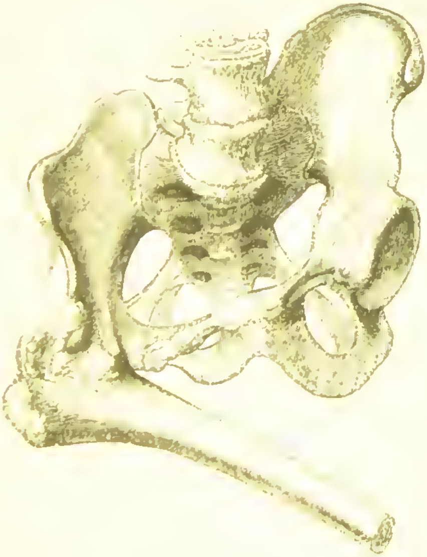
Flatness of the sacrum, with or without an alteration of the angle made by the sacrum with the vertebral column, is occasionally met with. The obvious consequences of this abnormality are, diminution of the antero-posterior diameter of the cavity of the pelvis, and obstruction to the intra-pelvic rotation of the fœtal head. Increased curvature of the sacrum is generally connected with some morbid condition of the bones, but as a deformity, *per se*, it is not of great interest. In some rare cases of spinal deformity, the curve of the spine is so considerable, that the lower lumbar vertebræ descend into the pelvis, and occasion a deformity equal in extent to a large exostosis, or the deformity of osteo-malacia. At the present time, these cases are attracting considerable attention in Germany.

Dr. H. F. Kilian describes very minutely a form of pelvic deformity depending on disease and displacement of the lumbar vertebræ to such an extent as to encroach on the pelvic area. He believes that by a disease of the cartilages of the lower lumbar vertebræ occurring after puberty, the cartilaginous structures are so softened as to allow the vertebræ to sink together, one upon the other, and thus produce a high degree of deformity at the brim.

Fractures and dislocations of the pelvis occasionally result in a diminution of its diameters. Such cases, however, are rare, as women are not generally exposed to those violent mechanical injuries which produce displacements of any kind, of the various segments of the pelvis. Mr. Barlow, however, performed one of his successful cases of Cæsarian section in consequence of distortion, resulting from fracture of an innominate bone. When fractures of the pelvis in women do occur, they are generally attended with permanent displacement, or other results which tend to diminish the capacity of the pelvis. The deposit of callus which takes place appears to be very erratic, but to have a tendency to encroach upon the cavity of the pelvis. Dr. Lever met with a case where there was a bony projection of more than an inch into the pelvic cavity, in consequence of a fracture of the acetabulum; and Burns relates a case where a similar ossific formation resulted from a similar injury, the projection being two inches long.

Miscellaneous deviations from a normal condition of the pelvis will include, in addition to those already mentioned, projections of various points of its osseous anatomy inwards, without any general vice of conformation; and the results of dislocation or anchylosis of the hip-joint, arising from morbus coxarius. (Fig. 149.)

Fig. 149.



Pelvic deformity, from anchylosis of the hip-joint.

The study of the Causes of those deformities which depend on irregularity of development, particularly the Oblique Pelvis, is a subject of great interest, and one which has occupied the attention of many obstetric authorities. This deformity has been explained in various ways, all having relations to the real or supposed laws under which the normal pelvis is developed.

The latest hypotheses have been those advanced by MM. Dubois and Gavarret, Dr. Herman Meyer, and Dr. Matthews Duncan. MM. Dubois and Gavarret suppose the development of the sides of the pelvis to depend on the wedge-like pressure of the sacrum between the innominata. When anchylosis exists in one or both of the sacro-iliac synchondroses, they suppose the wedge-like pressure to be destroyed, and in place of the natural curve of the sides of the pelvis, the line becomes straightened. When the anchylosis affects one side only, the development of the affected side is interfered with, while the other half of the pelvis is developed in a normal manner, and oblique distortion is the result. When there is a double anchylosis, both sides of the pelvis are straightened, and the deformity, instead of being oblique, is symmetrical. Dr. Matthews Duncan controverts these views of Gavarret very strongly. He maintains that the lateral curve of the pelvis is produced by the pressure of the trunk above, and the inferior extremities below, upon the sacral and cotyloid ends of the beams formed by the ilia. I believe the mechanical relations pointed out by Dubois and by Dr. Matthews Duncan really exist, and are effective to a considerable extent; that the sacrum acts as a wedge, and that the ilia acquire a tendency to curve from the pressure exerted by the sacrum from above, and the femora from below; but I submit that other considerations besides those of mere mechanical weight and pressure enter into the problem.

At the time of puberty we have the three permanent articulations of the true pelvis—namely, the two sacro-iliac synchondroses, and the symphysis pubis. We have also the **Y**-shaped triple articulation between the ilium, ischium, and pubis on each side. These make in all nine articulations, and seven separate bones for the true pelvis. These bones all grow from the centre to the circumference: and it is to their circumferential increase, taken collectively, that the expansion of the pelvis at puberty is attributable. It is not a little remarkable, that the division between the ischium, ilium, and pubis, should remain until after the completion of the development of puberty. The capacity of the pelvis must very much depend on the period at which the junction of these bones takes place. When anchylosis takes place between the sacrum and ilium before the period of puberty, the circumferential increase of the aspects of the sacrum and ilium engaged in the articulation is impossible. Hence the arrest of growth on the anchylosed side of the pelvis upon which oblique deformity depends. This appears to me to be the chief element in the *rationale* of the oblique pelvis of Naegelé. We have, as I believe, in anchylosis of the sacrum with the pelvis on one side, at a period anterior to the full development of the pelvis, the primary condition upon which oblique distortion depends. In the description of the normal pelvis I have dwelt on the importance of the joints of the pelvis, and the divisions of the different portions of the innominata in the obstetric development of the female pelvis. If a joint should become anchylosed in any part of the body before the full development of the bones entering into its formation, it is impossible that the bones constituting the anchylosed joint can grow to the full size. This is readily seen in the case of the knee and elbow-joints, when anchylosis occurs from disease of the bones in infancy or childhood. In the case of these joints there is, in addition to the mechanical impossibility of growth, the absence of the influence of muscular exercise. In the case of the sacro-iliac articulations, if the sacrum unites by ossific deposit with the ilium of one side, the portion of the sacrum connected with the ilium cannot increase in size, and the growth of the sacral aspect of the ilium is also suspended. The portions of the two bones in the neighbourhood of the anchylosis remain, as regards size, in the condition natural to childhood, while the remaining portions of the pelvis enlarge, and the side of the pelvic cavity opposite to the anchylosis increases even beyond the natural standard. The earlier the period of life at which the anchylosis occurs, the greater the extent of the deformity. Oblique deformity of the pelvis depends, according to this view, on the combination of a portion of the pelvis of the child or young girl with a portion of the pelvis of the adult female. This combination is further moulded, to some extent, by the mechanical causes incident to the position of the pelvis in the skeleton, and by muscular action. The rare cases of anchylosis in which no deformity is observed, are probably cases in which ossific union has been delayed until after the time of puberty. The medium of union between the sacrum and ilia, and the pubic bones at the symphysis, is also very much more consolidated after than before the development of puberty. It is probable that when this consolidation and the obliteration of the Y-shaped articulation takes place too early, we have, in some cases, the Infantile, or Equably Contracted Pelvis. When it occurs too late, we have, I would suggest, the Equably Enlarged Pelvis.

In the case of early anchylosis of some of the cranial bones, we have flattening and diminution of the size of the head in the vicinity of the anchylosis. I believe I have seen idiotcy occur from premature closing of the sutures of the cranium to such an extent as to prevent the growth of the brain. It appears to me, then, that the simpler explanation of the dependence of certain pelvic deformities upon the conditions of growth and development is much to be preferred to the recondite influence of mechanical and mathematical causes, which have occupied the attention of MM. Gavarret and Dubois, Weber and Mayer, with Dr. Duncan, and others. Passing from the circumferential increase of the pelvic bones themselves at puberty to the cause of this increase, we come to the action of the ovaria. It is to the development and activity of the ovaria at puberty that the development of the pelvis at this epoch is due. Where the ovaria are wanting, the pelvis is not developed, just as in the case of the removal or absence of the testes in the male the bones of the larynx do not undergo their usual development at puberty.

Instruments for obtaining the internal and external admeasurements of the pelvis were formerly much used in the diagnosis of pelvic deformities, and in forming an estimate of the proper treatment to be pursued. They have, however ingenious, gradually given way, particularly in this country, to the use of the educated finger, as the best of all pelvimeters. Before the coming-on of labour, deformities of the pelvic brim may sometimes be measured by introducing the two first fingers, and separating them so as to touch the promontory of the sacrum and the symphysis pubis, and then altering their position so as to measure the transverse diameter. Where the deformity is high up, this manipulation fails, and it becomes necessary to introduce the whole hand into the vagina, when a satisfactory exploration can be made. Deformities of the outlet may be diagnosed by the finger alone, with sufficient readiness, by the practised accoucheur. Before the coming-on of labour, we have, in cases of deformity, to compare the diminished pelvis with the pelvis of average size. In actual parturition, we have to compare the deformed canal with the size of the fœtal head which has to descend through it. A given amount of deformity may of course be very formidable or of little import, according as the child is mature or premature, living or dead, or according as the head is large and ossification more or less perfect. In labour, it is more difficult to introduce the whole hand, but this is sometimes necessary and proper, when the head or presenting part is arrested high up in the pelvis. The single finger passed in to its utmost length and rotated within the pelvis, will seldom fail to inform us of the existence of deformity or diseased growths in the pelvis. This information having been acquired, we can introduce two or three fingers, or the whole hand, as may be necessary, to make out the special condition of the pelvis.

The Treatment of labour, complicated with deformed pelvis, varies according to the amount of impediment presented, and according to the risk in which the mother is placed by the energetic action of the expelling powers when the fœtus cannot pass through the pelvis in the ordinary manner. The aids to delivery, under these circumstances, are the Vectis, the short or long Forceps, according as the head may be arrested at the outlet or brim of the pelvis; Turning, in cases of shoulder presentation, and also in certain cases where the deformity is such as to warrant the belief that the head may be extracted, but where the forceps are inapplicable; Craniotomy, in cases where the head of the living child cannot pass, or where the continuance of labour, without assistance, endangers the life of the mother; and lastly, the Cæsarian Section, in cases where the delivery of the child by perforation and the crotchet is impossible. But before and beyond all these means, except in cases where the action of the Lever, or the compression and extraction exerted by the Forceps, is sufficient to give birth to the child alive, the remedy, or rather the preventive of danger, is to be found in the Induction of Premature Labour. A great and beneficent extension of the operation for the induction of premature labour may be made in these cases, and it is questionable, nay, almost certain, that the fatal operation of hysterotomy would rarely, if ever, be called for, if this operation were always performed in cases of distortion, and at the proper time.

The cases and circumstances under which these several procedures become necessary, in the management of labour complicated with deformity, will be entered into more fully when treating of these operations themselves in a subsequent part of the present work.

CHAPTER XXXIII.

OBSTRUCTED LABOUR.

Having considered the subject of Pelvic Deformities in the two preceding chapters, I wish, before directing attention to impediments connected with the Soft Parts, to make a few remarks respecting those morbid states of the Coccyx which interfere with labour. The joint between the first bone of the coccyx and the extremity of the sacrum may become anchylosed, or the mobility of the separate bones upon each other may be destroyed by bony deposit. Anchylosis of the coccyx may depend on inflammation, the result of blows or violence; scrofulous disease of the sacrum and coccyx; injuries occurring during difficult labours; or it may exist as a natural condition in women who become pregnant for the first time late in life. The coccyx may from these causes become fixed in its natural position, it may be curved forwards, or it may be bent at right angles with the extremity of the sacrum. In either case it may interfere with the progress of labour, but particularly when the bone is bent forwards to a considerable extent. Sometimes, as in a case which recently fell under my observation, the coccyx is not only incurvated forwards, but it is considerably enlarged by scrofulous disease. Encroachment of the coccyx upon the diameter of the pelvis to such an extent as to interfere with labour is not a very common event, but in the accumulated records of obstetric practice many cases are met with in which an anchylosed coccyx has interfered with the course of labour to such an extent as to cause the loss of the child. In some cases, fracture of the anchylosed coccyx has occurred from pressure of the head, and in other instances this operation has been performed by the accoucheur. The diagnosis of coccygeal anchylosis is not very difficult. The immovable bone can be felt by the finger in making an examination, and the extent of the impediment to the escape of the fœtus readily appreciated. The treatment in such cases must be either the application of the forceps, fracture of the anchylosed bone, or the induction of premature labour in cases where the amount of impediment is great, and particularly where it has in previous labours led to the loss of the child. No serious injury has resulted from the breaking down of the anchylosis, either artificially or when the accident has occurred in the course of labour; but in some cases the bony union is so firm as to render this impossible, under the disadvantages at which the accoucheur is obliged to act. In many cases of otherwise natural labour, the coccyx is bent back to such a degree as to leave a painful condition of the sacro-coccygeal articulation for months, or even years after the occurrence of labour. This state is generally relieved by counter-irritation over the sacrum.

Mechanical obstructions to the progress of labour, depending on the state of the Soft Parts of the Mother, may occur at any point of the parturient canal, between the uterus itself, and the external parts of generation. In managing such cases, we have to remove or diminish the obstructions to such an extent as to admit of the passage of the child; or we have to evade them by inducing premature labour at a time when the size of the fœtus is such as to allow of its transit. In many of these cases, other considerations besides those relating to the mechanical obstruction to delivery have to be taken into account. The obstructions themselves may depend upon constitutional states, or they may excite other disturbances apart from the impediments to bour.

When speaking of the management of ordinary labour, I ave referred to those cases of rigidity of the os uteri which dmit of relief without operative means. Occasionally, cases e met with where the rigidity is excessively unyielding, or which the matter passes beyond rigidity, and there is agutination, occlusion, or apparent obliteration of the os. This alformation may exist to such an extent that labour becomes npossible, unless rupture of the cervix takes place, or artiial assistance can be rendered. In cases of this kind, rupre of the uterus has occurred, in others the whole of the wer segment of the uterus has sometimes been separated in e form of a muscular ring, and detached from the rest of e uterus by the strength of the pains acting against an cluded os. Other patients have died undelivered, where pture has not occurred, and where no operation has been rformed.

Excessive rigidity and diminution of the os can be readily derstood, but entire Occlusion is difficult of comprehension. e causes of this extraordinary state of things are, it must be confessed, involved in obscurity. It has been supposed by some authorities that the marginal surfaces of the os uteri adhere together as a consequence of inflammation. Others believe that a false membrane is thrown out, which entirely seals the cavity of the uterus. Naegelé the younger describes a thin membrane as being the medium of occlusion in certain cases. Many observers have declared their disbelief in the possibility of entire obliteration of the os, and have believed that in cases where it has been supposed to exist, the os uteri was only raised so high towards the sacrum by anteversion as to render it impossible to reach the aperture. So much concurrent testimony exists, however, in proof of the real occurrence of what appears to be entire obliteration, that the reality of its existence cannot be doubted. Dr. Ashwell relates a case in which incision was required in four successive labours in the same woman, attended by different practitioners. The os uteri could not be detected. Similar cases have been recorded by Dr. Lever. Smellie, Hamilton, Naegelé, Gooch, Dubois, and others, have also related cases in which there was entire or partial obliteration at the time of labour.

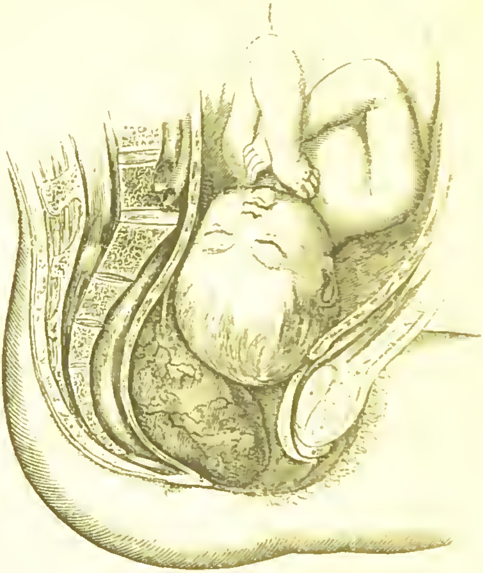
It is evident that even in the worst cases there must have been an os uteri to render conception possible. But in some women the os and cervix are very imperfectly developed in the unimpregnated state, the aperture remaining so small as not to admit a probe without difficulty. The degree to which the os and cervix develop during pregnancy is very different in different individuals, and there is no doubt that some at least of the cases of supposed occlusion of the os are in reality cases in which the fundus uteri has become developed to a norma extent under the influence of gestation: but the os, originall small, has remained altogether undeveloped, or nearly s This explanation seems to me more in accordance with th known physiological history of the uterus than adhesion o the sides of the os, or the organization of a false membrane i the aperture. It can readily be understood that when the o has remained throughout pregnancy of the small size natur to some women in the unimpregnated state, it cannot be d tected by the finger in the large surface presented by t expanded inferior segment of the uterus. In some of t cases in which incision has been practised, the os uteri h been examined a considerable time after labour, and the and cervix have been found small and imperfect. Some cas of simple rigidity, no doubt, depend on the undeveloped st of the os uteri, the unyielding os of the unimpregnated state being as it were affixed to the gravid uterus. No doubt in other cases the rigidity depends on morbid conditions of the os uteri existing before the commencement of gestation, or the result of injuries inflicted in former labours. It is now known that slight laceration of the os uteri very frequently occurs during the passage of the head, and the cicatrizations resulting from such injuries may well give rise to subsequent rigidity of the os during labour. The violent cauterizations of the os uteri practised in the present day have probably produced rigidity during labour. Mr. Thompson, of Westerham, recently published a case apparently of this kind. Adhesion and obliteration of the openings of any of the orifices of the mucous canals of the body are, it is well known, exceedingly rare. I have, however, met with a case in which, where the labour was natural, the os uteri became so perfectly occluded during the involution of the uterus, as to require the use of the hysterotome before the discharge of the catamenia could occur. In some of the most perfect cases of occluded os, it is found moreover that no signs of inflammation have existed during pregnancy. It is quite possible and probable that some of the cases of occlusion have been cases in which the os uteri was too high and directed too much backward to be reached in an ordinary examination. In a supposed case of this kind, it is very important to arrive at a correct diagnosis. Anteversion should be suspected, and the position of the uterus rectified when this state exists, before arriving at a positive conclusion. In making an examination in such a case, the finger should not be trusted to alone, since it cannot reach the os uteri, but the whole hand should be introduced into the vagina, and the posterior part of the lower segment of the uterus carefully explored. It has been found that, however small the os, if it can be detected, and the disposition to dilate imparted to it, the full dilatation is frequently effected with considerable rapidity. When other means fail, therefore, the lower segment of the uterus should be explored by the aid of the speculum, as an aperture so small as to escape the finger may become visible to the eye.

The correct treatment of such cases is a matter of great importance. When the continuance of the pains of labour for some hours, and the use of venesection, opium, emetic tartar, or chloroform, have failed to cause dilatation, and when the patient is threatened with serious symptoms, it is necessary to use mechanical means for the dilatation of the os uteri. The choice lies between dilatation of the os with the finger, or with sponge tents, or the incision of the uterus at its thinnest portion. Of course dilatation is only applicable to those cases in which the os can be found, but is so minute as to render delivery impossible without assistance. When dilatation can be effected without violence, no doubt it is to be preferred to the making of an artificial os. Hitherto, the finger or the bougie has been used for the purpose of dilating the os uteri, but there is no doubt the sponge tent will prove a most efficacious means of dilatation. When dilatation cannot be effected, labour makes no progress whatever; incision should be practised, the proper time for the operation being at that period when natural or artificial dilatation is shown to be impossible, and when the woman has nevertheless not as yet passed into a state of danger. The fatal cases which have occurred after incision are generally cases in which the operation has been too long delayed. As to the mode of operating, some have recommended numerous incisions round the real or supposed site of the os; others have recommended one incision, from before backwards, with a blunt-pointed bistoury. The reason for making an antero-posterior incision is, that the uterine arteries may not be wounded; but the bladder in front, and the rectum behind, must be carefully avoided. The incision need not be of any considerable length, as it is enlarged subsequently to a sufficient extent by the pains. This operation, although never to be performed but on just grounds, is not so formidable as it would appear to be. I have already referred to the case of a woman in whom it was necessary in four consecutive labours, after all of which she recovered favourably. In some cases delivery is obstructed by the powerful contraction of the os and cervix after its full dilatation. The neck of the child may be held so firmly after the delivery of the head, or in breech cases before the descent of the cranium, as to render the progress of the child impossible until the spasm has been overcome. This can be generally effected by a full dose of opium or the inhalation of chloroform.

In cases of Fibrous Tumour growing from or on the walls of the uterus, near the os and cervix, the tumour or tumours may descend in the pelvis before the head or presenting part of the child, and cause a very serious obstacle to the progress of labour. The diagnosis of such tumours from ovarian tumours is often difficult or impossible, unless made before the coming on of labour. The fibrous tumour is commonly more dense and irregular in shape than the ovarian. Wedged into the pelvis, these tumours not only obstruct labour, but are themselves injured and contused by long-continued compression between the fœtal head and the pelvis. In some of the fatal cases of this kind, the tumours have been found in a state of pulpy softening and disorganization. The secondary disease of the tumours has evidently, in such cases, contributed largely to the death of the patient. Cases have occurred in which, during labour, these tumours have been pushed by the hand of the accoucheur above the brim of the pelvis, so as to be removed from danger and the possibility of acting as an obstruction. In others, it has been necessary to use the forceps, to turn, or in the worst cases, to perform craniotomy. Dr. Montgomery relates one in which the obstruction was so great that the Cæsarian section had to be performed. These serious results show very conclusively that in all cases of fibrous tumours encroaching largely upon the pelvic brim, the induction of premature labour, as recommended by Dr. Ashwell, should be resorted to. Very recently I saw, with Dr. Trouncer, a case of late fibrous tumour attached lower down to the posterior wall of the uterus, complicated with placenta previa. The placenta was attached to the anterior wall of the cervix, and the anterior portion of the os. This part of the uterus was well developed, but the posterior part below the tumour was scarcely thicker than parchment. The woman was delivered by turning, and recovered, but the child was still born. After the labour, suppuration of the tumour took place.

The existence of Uterine Polypi commonly prevents impregnation, but cases occasionally occur in which gestation proceeds notwithstanding their presence, or they are developed during pregnancy, and at the commencement of labour they emerge from the uterus, and prevent the progress of the fœtus. These growths arise from the labia uteri, the interior of the cervix, or the cavity of the uterus. When they arise from the lips of the uterus, they are frequently, as observed by Dr. Heming, hollow and contain fluid; but when attached to the neck or body of the organ, are of fibrous character and of larger size. Their attachment to the os uteri, or emergence from within the orifice, can be made out without great difficulty. Polypi have sometimes been detached from the uterus by the force of the pains. Where they are of such large size as to interfere with labour, the fluid tumours should be punctured, when they at once collapse; and the solid polypi should be removed either by ligature, torsion, or excision. (Fig. 150.)

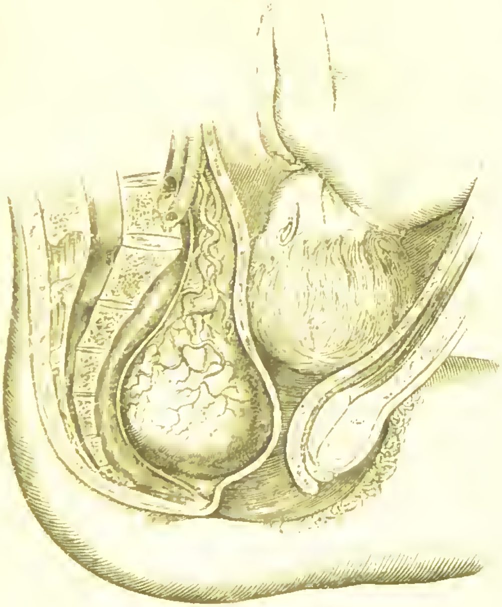
FIG. 150.



Labour impeded by uterine polypus.

In cases of Ovarian Tumour, the important point is to distinguish between cysts containing fluid and solid tumours. The former have been safely punctured through the vagina, as advised by Merriman and others. In cases of ovarian dropsy co-existing with pregnancy, tapping should be performed some time before the coming on of labour. Much care is required in making the diagnosis, but I have not seen any ill results follow from tapping during gestation, and I know of cases in which a permanent cure has followed the operation. In the case of solid tumours, so large as to impede delivery, nothing can be done with the tumours themselves beyond attempting to lift the mass above the pelvic brim. When this is impracticable, it only remains to be considered whether the child can be delivered by the turning or the forceps, or whether craniotomy may become necessary. (Fig. 151.)

FIG. 151.



Labour impeded by ovarian tumour.

Carcinoma of the Os and Cervix Uteri, when the os is diseased to a great extent, sometimes presents an insuperable obstacle to the completion of delivery. Cases of this kind have occurred in which labour apparently did not come on at the usual time, but the fœtus remained for months after the full term in the uterus. When allowed to proceed without interruption, mangling of the os uteri, excessive hæmorrhage, and death, are almost inevitable. When the disease is detected early in pregnancy, premature labour should be induced. When pregnancy has passed to the full term, Professor Simpson has recommended vaginal hysterotomy, or the lateral incision of the os and cervix, so as to admit of delivery with the aid of the forceps. In some cases of this kind, craniotomy is required. In a celebrated case, Dr. Oldham performed the Cæsarian section, the mother and child living for some time afterwards. In the worst cases of this kind, when the mother has but a short time to live, and when the child is healthy, the reasons for the performance of craniotomy or the Cæsarian section are more evenly balanced than in most others; but I incline to the former, since the value of a brief space of existence to an adult mother should outweigh the precarious life of the unconscious fœtus.

Contraction and Rigidity of the Vagina may depend upon the age of the patient; the former existence of abscess; cancerous induration; cicatrizations following injuries occurring during instrumental or difficult delivery in former labours; the cicatrizations of pelvic abscess, recto-vaginal fistula, &c., and may consist of simple diminution of the calibre of the canal, puckering of its walls, the existence of bands or septa, and almost complete closure of the vagina, or Atresia. These contractions, which often become of cartilaginous hardness, are readily distinguished by the finger from any other form of impediment. It is remarkable what an amount of contraction may be reduced or drawn out by the pressure of the membranes and the advancing head, or presenting part, when the secretions are abundant, the progress of the labour moderate, and no inflammatory action is set up. There is in the vagina not merely the power of distension under pressure, but an active tendency to dilatation, similar to that possessed by the os uteri. In the management of these cases, it is important that the labour, particularly in the propulsive or expulsive stages, should be gradual; with this view, as well as the supply of fluid pressure, the membranes should be preserved as long as possible. Venesection, nauseating doses of tartar emetic, warm bathing, vaginal fomentations, and the relaxing effects of chloroform, are useful in severe cases; and in those that do not yield to these measures, careful division of the constricted portions with the knife is necessary. When the deformity of the vagina is excessive, and cannot be remedied by these means, and when the life of the mother is threatened by the continuance of labour, craniotomy may become necessary. After delivery, these cases require careful management by fomentations and the use of antiphlogistic means to prevent inflammation and further contraction. When the patient is convalescent, bougies should be used with a view to prevent the interference of contraction with succeeding labours. Unless these precautions are used it may happen that complete atresia, with retention of the catamenia, may follow. Dr. Meigs has related such an instance; and recently a similar case was in St. Mary's Hospital. Besides contraction of the passage, the vagina is in rare cases blocked up by Polypoid Tumours growing from its walls. Several cases of vaginal polypi are figured by M. Huguier. In labour occurring under such circumstances, it would be necessary to puncture these tumours when they contain fluid, or to remove them, when of a fibrous structure, by the scissors or polypus hook.

The area of the vagina may be intruded on by other tumours foreign to the vagina itself. Of these, Ovarian tumours, Polypoid tumours springing from the os or cervix uteri, Rectocele or Vesicocele, Fæcal collections and Stone in the bladder are the most important.

In the complication of labour by Cystocele, the bladder, as described by the late Mr. Crosse, is prolapsed, and descends behind the pubis and before the head of the child. When full of urine it offers considerable resistance to delivery, and may itself become ruptured. This state does not, I believe, as is commonly supposed, depend on any neglect of the patient or accoucheur in evacuating the bladder, but it arises from prolapsus of the bladder existing before and independent of pregnancy. It is remedied by catheterism, but it is necessary to pass the catheter downwards and backwards in such a case. Care is required in the diagnosis of this affection, as it has happened that the distended bladder has been mistaken for the amnion, and punctured under such misapprehension.

The Impaction of Fæces in the Rectum may offer considerable impediment to labour. This may depend on simple constipation, or on the accumulation of magnesian deposits in patients accustomed to take this alkali freely for the relief of heartburn or as an aperient. At first, some of these cases give to the finger the impression of exostosis, but a careful examination detects the real nature of such tumours. The remedy of course consists in the removal of the indurated mass by enemata, or, in the worst cases, by a process of excavation. It sometimes happens that the posterior wall of the vagina is prolapsed during labour, giving rise to Rectocele. In the bag thus formed fæcal accumulations may take place and encroach upon the vagina, but this state of things is readily removed by enemata.

Cases have been recorded by Guillimeau, Smellie, Dubois, and others, in which pregnancy has occurred coincidently with Calculus in the Bladder. When the stone is large, and descends before the fœtal head, delivery is sometimes rendered impossible. When it is small, the bladder may be lacerated, and vesico-vaginal fistula be the result. Some time ago, a patient was under the care of Mr. Brown in St. Mary's Hospital, whose bladder had been lacerated some years previously by a stone during labour, which had remained undetected in the bladder. I know of another case in which death occurred from the complication of calculus in the bladder with labour. The presence of stone cannot well be mistaken for any other contingency of labour, from its situation and moveable character. When the stone is detected early, it can generally be passed above the pubis, and little or no mischief results. When, on the other hand, the descent of the head and the size of the stone render this impossible, the rule is to perform the operation of lithotomy through the vagina. Probably lithotrity would be the preferable operation in some of these cases; but I am not aware that it has ever been resorted to.

Labour may be obstructed, as pointed out by Hamilton and others, by diffuse swelling of the whole of the soft parts of the parturient canal. This is very apt to complicate labour depending upon obstruction of any special kind. In cases of deformed pelvis, for instance, there is commonly considerable swelling of the soft parts, the result of pressure. In other cases, the tumefaction depends upon plethora, or excitement of the passage under the influence of the normal pressure incidental to labour. The treatment in such cases, as far as the tumefaction is concerned, depends on antimonials, venesection, and careful evacuation of the bladder and rectum.

Numerous cases are on record, and I have myself met with several instances, in which women with a cribriform Hymen, or with the hymen in a state of almost cartilaginous hardness, and an aperture of small size, have become pregnant, and the structure has remained undisturbed until it came to be an impediment to labour. The pains of expulsion would no doubt in all such cases tear through this obstruction, but it is much less painful to make a crucial incision before the parts have become distended; still better, this operation should be performed, when the nature of the case is known, during pregnancy, and such cases generally are known, because women in whom intercourse has been imperfect, mistake the signs of pregnancy for a tumour or suppression of some kind, and apply for professional advice.

The obstructions limited to the Vulva, consist of a Varicose state of the labia, Œdema of the labia or nymphæ, and Encysted or Fibrous tumours of the labia. The enlargements mentioned are generally connected with hyperæsthesia of these sensitive parts, and the suffering they occasion is usually of greater consequence than their mechanical interference with parturition. In the case of extensive œdema from the pressure of the gravid uterus in the latter part of labour, or from the existence of albuminuria, it may be necessary to puncture the skin in several places with a fine needle, as recommended by the late Mr. Ingledue, in order to let off the effused fluid, particularly when this state of things occurs in a primiparous woman. Occasionally the swelling in these cases is enormous, and it is difficult or impossible to make an examination. Sometimes fomentations will relieve the pain, and promote the relaxation of the skin to such a degree, that the fœtal head passes slowly and safely. The ergot of rye is useful in some of these cases, and is to be preferred to the forceps, as causing less risk of laceration. It is only with great difficulty that the forceps can be used in considerable swellings of the external parts, and the risk of lacerating the vulva or perinæum with the instrument is very great. When œdematous swellings of the vulva are neglected, serious consequences may ensue. Cases are recorded in which sloughing has occurred from this condition, to such an extent as to destroy the patient. In Thrombus, or in varicose states of the vulva, pressure should be exerted on the parts, or cold applied during the pains, so as, if possible, to prevent excessive dilatation and bursting and effusion into the cellular structure of the labia. It is generally at the moment when the head passes that the varicose tumour bursts from excessive distension. In cases where the effusion takes place before the termination of labour, little can be done beyond the use of pressure and cold, as the blood rapidly coagulates in the cellular tissue, and cannot be evacuated by puncture. Obstruction of the vulva from large encysted tumours (unless the contents are fluid), or fibrous tumours of the vagina, the latter of which sometimes grow to an immense size, can only be dealt with efficiently before the coming on of labour, or before the advent of pregnancy itself. When the encysted tumours contain fluid, as in the cases described by M. Huguier, puncture by a fine trocar will procure immediate relief. In rare cases, the Perinæum is so rigid and unyielding as to offer an insurmountable obstacle to the advance of the head. Under these circumstances, when fomentations, tartar emetic, venesection, and chloroform have been inefficient, it has been recommended that the perinæum should be incised. Incision may sometimes prevent extensive laceration, and the incised wound heals readily after labour. The force of the uterus would, in almost all cases, overcome or break through the impediment offered by a rigid perinæum, so that we must look on incision of the perinæum as a preventive of rupture or extended laceration rather than a means of removing obstruction.

CHAPTER XXXIV.

DIFFICULT LABOUR DEPENDING ON THE STATE OF THE OVUM.

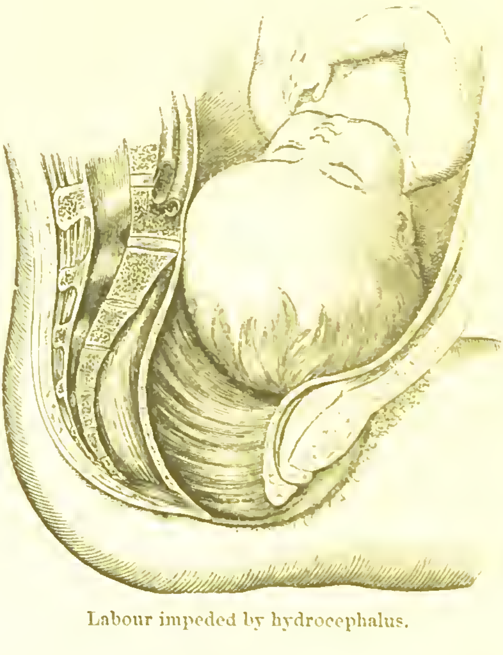
This form of Dystocia may depend upon dropsy of the different serous cavities of the fœtus; tumours or distensions of other parts of the body; colossal size of the fœtus, without relative disproportion; morbid ossification of the joints of the body generally, and especially of the cranium; the various teratological monsters and errors of development; twins; shortness of the funis umbilicalis, and excessive rigidity of the membranes. Of these various impediments to natural delivery, Hydrocephalus occurring in the fœtus is perhaps the most important, and to this complication attention will first be directed.

Hydrocephalus may occur to the fœtus in utero to such an extent as to interfere with labour, or render it altogether impossible. The size which the head sometimes attains in these cases is enormous. Several pints of fluid have been known to escape after perforation, and Merriman mentions a case in which a head, the circumference of which measured twenty-two inches, was born alive by the natural efforts, the average circumference of the head measuring about fourteen inches.

In these cases, the bones are generally thin, the fontanelles large, and the sutures membranous and gaping. Hydrocephalic children may present with the head; but, as formerly mentioned, there is in these cases a great tendency to the presentation of the pelvic extremity of the child. When the head presents in hydrocephalic cases, the symptoms are, arrest of the head above the brim of the pelvis, there being no deficiency of the expulsory action, and no pelvic or other impediment to the descent of the head on the part of the mother. When examined, the area of the cranial surface, which may be reached by the finger, is flatter than usual, conveying the impression of belonging to a larger and generally a less dense spheroid than the natural fœtal head. (Fig. 152.) Under the influence of strong pains, and when labour has been of long duration, the rounded shape of the head is altered, the edges of the cranial bones can be felt through the fontanelles or sutures; and fluid can be detected, somewhat like the fluid when the amnion is unruptured and the membranes are more dense than usual. In the irregularity and projection of the edges of the bones, the hydrocephalic head resembles the head of the premature fœtus, or of the fœtus at the full time with the head imperfectly ossified, only that in the case of hydrocephalus the size is greatly increased. When the fœtus is dead, the flaccidity of the hydrocephalic head is commonly greater than usual. When the pains relax, this sense of fluid disappears. In breech or footling cases complicated with hydrocephalus, the diagnosis is more difficult. There is in such cases a natural descent of the pelvic extremity of the body of the child until the head comes to engage in the pelvis, when a sudden arrest takes place, notwithstanding the continuance of strong and regular pains, and the portion of the head of the child which can be reached gives the impression of a large, loosely-ossified cranium. The limbs of the child are generally shrunken or wasted.

It might be supposed that in a case of hydrocephalic head, when the bones are thin and readily compressible, labour would take place easily, and without bad results. Such is not, however, the case. As just mentioned, cases do occur in which hydrocephalic heads considerably above the average circumference pass through the pelvis without assistance, but these are exceptions, and a favourable result by the natural powers cannot be depended on when the amount of fluid is large. The cause of the difficulty depends not only on the large size of the head, and in some cases upon its extensive ossification, but on the loss of the proper cranial shape under pressure, and the consequent want of due mechanical relation between the head and the screw-like arrangement of the pelvis. The head passes through as a matter of brute force, instead of in the rotatory manner natural to the well-formed fœtal head. There is not only difficulty as regards the actual passage of the head, but there is considerable danger to the mother in these cases. Left to themselves, they are very liable to be attended by serious results. The uterus may be ruptured, or the vagina lacerated, by the force of the pains; or exhaustion may be produced. The head of the child, instead of preserving any definite relation to the pelvis, is jammed into the cavity, as

FIG. 152.



Labour impeded by hydrocephalus.

insisted upon by Dr. Ramsbotham, so as to fill it equally in all directions. The irregular edges of the bones are liable to damage the soft parts, and numerous cases are on record in which inflammatory action, sloughing, and death have been thus caused. Occasionally, a spontaneous resolution of the difficulty occurs by the rupture of the head, and escape of the contained fluid under the pressure of the pains. This happens more frequently when the fœtus is dead, and partially decomposed, than under other circumstances. Dr. Robert Lee, Prof. Simpson, and others, have pointed out that in some cases there is not merely expansion of the head, but the cranial bones are greatly developed, and the sutures comparatively closed. Of course, under these circumstances the difficulties of delivery are greatly increased. Out of seventy cases collected by Dr. Thomas Keith, he remarks the significant fact that the uterus was ruptured in sixteen. The mixture of solid and fluid pressure brought to bear on the os uteri and the vagina in cases of hydrocephalic births, is perhaps greater than under any other circumstances whatever. In five cases to which Dr. Lee was called in consultation, and which are related in his Clinical Midwifery, the mothers all died, either from inflammation or rupture of the uterus; but he observes that, had perforation been performed sufficiently early, some or all of them might have been saved. In hardly any of the emergencies of midwifery are an early diagnosis and prompt action more imperatively called for.

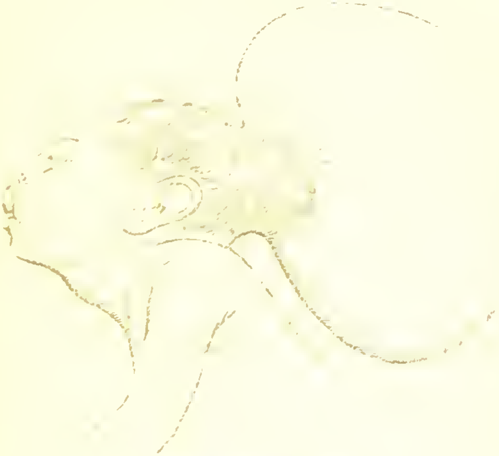
The treatment of these cases is sufficiently simple, when an accurate diagnosis has once been made. We must evacuate the fluid when the size of the head is so great, and the progress of the labour so slow, notwithstanding effective pains, as to lead to the conclusion that the case cannot be safely left to a natural termination. In many of these cases, the child is already dead, or dies during labour, in which case all scruple respecting craniotomy will of course disappear. When the life of the mother is in imminent danger, the perforation of the head may be more cheerfully performed than in almost any other cases, as the chances of living after birth are so slight, even when most favourable, that we cannot compare them with the life of the mother, to the extent we are sometimes warranted in doing when the fœtus is strong and healthy. Every care should be taken to make out such cases with accuracy, as it would be a grievous mistake to perforate the head of a healthy fœtus, instead of a hydrocephalic child. Time should also be given to make the case clear, but without waiting so long as to endanger the serious injury of the mother.

After the perforation of the head, the escape of fluid generally diminishes the size of the head to a greater extent than occurs in craniotomy under any other circumstances, and delivery is generally easy. Sometimes, the head is perforated for arrest, when hydrocephalus has not been suspected, when the sudden escape of the fluid gives the first indication of the nature of the case. Prof. Simpson suggests that the perforation of the head by a small trocar may be preferable to the use of the perforator and scissors, as by this means the fluid can be evacuated and the head diminished so as to render delivery possible, without necessarily destroying the child. He also throws out the hint that in pelvic presentations, in hydrocephalic cases, the fluid may be drawn off by opening the vertebral canal in any part of the spine.

Ascites is another form of dropsy to which the fœtus is liable, and which sometimes exists to such an extent as to interfere with labour. This may be confounded with tympanitis occurring in a dead child; but, as Dr. Fleetwood Churchill remarks, in tympanitic distension there is generally crepitation from the presence of air in the cellular tissue of the face and chest, when the head presents and has been delivered first, in such cases. Ascites may also be confounded with excessive secretion of urine, and its retention in the fœtal bladder, as pointed out by Depaul. The proper treatment in cases of ascites is to puncture the abdomen of the fœtus and evacuate the liquid. This operation should be performed by means of a long fine trocar. While speaking of ascites, it may be mentioned that from adhesion or stricture of the urethra, the fœtal bladder may be enlarged to such an extent as to reach the scrobiculus cordis, or the pelvis of the fœtal kidney may be distended to an enormous size. Such cases can hardly be distinguished from ascites, and if this were possible, the treatment—that of puncture of the accumulation by the trocar, when it interferes with labour—is the same.

In connexion with these forms of dropsy, we must consider other cases of accumulation of fluid in the serous cavities, particularly of the brain and spinal marrow, attended by deficiency of the bones, muscles, and integuments, forming Spina Bifida, and which are sometimes so large as to interfere with the progress of labour. Dr. Meigs describes a case of dropsy of the head, combined with fissure in the posterior walls of the cranium, where the extra-cranial tumour was in its greates length nine inches long. Ruysch relates one in which the tumour was as large as the head itself. I have seen a case in which the tumour was considerably larger than the head, and the subject of it lived until after the time of puberty, the cerebral development being very small. The head was carried forward, and the tumour rested on the shoulders in standing or walking. Similar tumours may form at any part of the spinal column, but they are more frequent in the cranial and sacral regions than in other parts. When not of large size they impede labour but little. In the case referred to by Dr. Meigs, and which is figured below, the head was born first, when, the tumour remaining above the pubis, the rest of the body was born by spontaneous evolution. (Fig. 153.) After this, Dr. Rohner, the attendant, was able, by powerful traction, to bring down the watery tumour without injury.

FIG. 153.



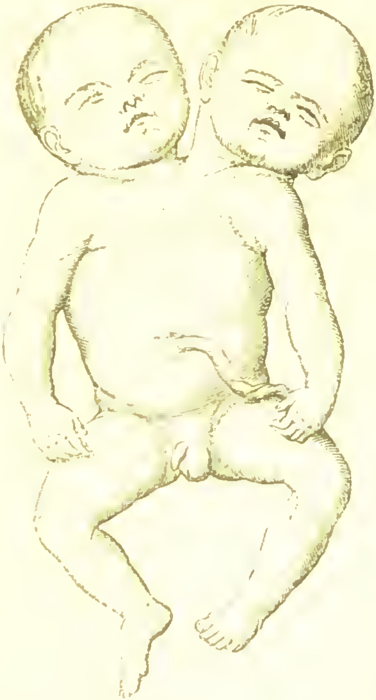
Case of spina bifida.

When speaking of the development of the serous amnion, and of the serous cavities of the body generally, by the processes of inclusion and separation of the various parts of the serous layer of the early ovum, I have mentioned that, in some cases, the same secretion or serum which is physiological in the amnion is apt to take place in the serous incubranes of the young fœtus, when it becomes pathological, constituting the earliest forms of dropsy in the animal economy. All the serous accumulations we have now been discussing, in the brain, spinal marrow, and peritoneum, arise in this way, as the result of inflammation or erratic development, and are frequently found to exist in combination with dropsy of the amnion itself. In the case of serous tumours of the head and spine, and other tumours in which the serous membranes are protruded externally, there is, in addition to excessive serous secretion, deficiency of the development of the bones, muscles, and integuments, all of which are developed from the primary serous layer. When there is malformation as well as serous tumour, the case is probably dependent on an error of development: where there is no malformation, inflammation of the serous membranes has generally existed, and the evidence of this is frequently found in post-mortem examination.

Teratology, presents us with a number of monstrous combinations of twin children, in which either two fœtuses are fused together to a greater or less extent, or in which they are joined together without any great extent of organic union. There may be two heads with only two arms and two legs, the bodies being fused from the neck to the sacrum (Fig. 154), or there may be the same extent of union with four arms and four legs; there may be one head and a large trunk composed of the fusion of two bodies, possessing four legs and four arms. In the case of two children perfectly formed, or nearly so, but united at one point, the union may occur at different parts of the body. The forehead or vertex of two children may be united. The union may be at the side, or at the sternum, or by means of the intestine only, at the umbilicus. The sacrum is another point at which union takes place in these cases. The union or fusion is always symmetrical. In accordance with that plan of development in twin cases, alluded to in the embryological portion of the present work, it is only the same parts in opposite children that admit of union—that is, it is head to head, side to side, sacrum to sacrum, and never any heterogeneous union which occurs.

These cases are happily rare, but they present considerable difficulties to the completion of labour. It might seem impossible that in such as that figured below, natural delivery should be effected, did we not know that these monsters are not only born, but, as in the case of the Siamese twin, the African twin recently exhibited in this country, and other well-known cases, the double monsters have lived, and have even reached

FIG. 154.



Double-headed monster.

maturity. Favourable circumstances must concur to enable double monsters to be born alive. The children must be small or premature, and the pelvis full-sized. But little is known of the mechanism of parturition in monsters. In the case figured above, an account of which is related by Dr. Meigs, spontaneous evolution occurred. One head came down first; this was delivered, and became fixed against the pubic arch, when the body came down in the manner described when speaking of the process of evolution in arm cases, the second head being delivered last. Dr. Meigs points out that it can only be by this method that double monsters are generally delivered.

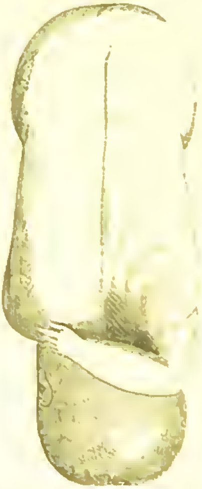
Even when the feet present, and the union is at the sacrum or any part of the trunk, after the delivery of the buttocks, the upper part of the body and head must descend by a process of evolution. We do, however, know that, in twin cases, it happens at rare conjunctures, that the two heads, or the head of one child and the pelvis of another, engage in the pelvis simultaneously. In such a case as the Siamese twin, it is impossible to conceive but that if a head presented in the first instance, one child must have been delivered down the point of union, when the rest of the same fœtus must have been delivered by a method similar to that of spontaneous evolution. Such cases afford the proof that, in some instances, both children may be born living, and viable. But, in many cases on record, it has been necessary to diminish the child by amputation of the head and evisceration. Such cases are puzzling to the accoucheur in the first instance, and no rule of diagnosis can be given for them. The obstetrician must depend upon his general knowledge and resources for the detection and management of such cases. At first they must prove exceedingly perplexing, but they would gradually reveal their true nature as the course of labour proceeds. The same principle must be followed in these as in other cases where, from disproportion, the living child cannot pass with safety—namely, delivery, destruction, evisceration, and mechanical delivery of the remnants of the twin monster. The Law, it should be observed, takes the same cognizance of monsters as of normal children. In destroying the fœtus we must not at all take the fact of the monstrous birth into consideration, save in so far as it becomes an additional difficulty in delivery, and conveys a greater probability than usual that natural delivery cannot possibly be effected. When women have been delivered naturally in such cases, great suffering, and subsequent inflammatory disorder, have been recorded. The possibility of using the forceps, as an aid to delivery in such cases, can only be decided on by individual peculiarities: certainly no rule can be laid down.

The different forms of Ectopy, in which from faulty development of the parietes of the body at the mesial line, organs which should be internal are external, in the rare cases in which they occur, sometimes complicate labour. In cases of Exomphalos, when the liver or intestines have protruded through the umbilicus, the tumours have been met with of very large size. Large bulk of the child, without disproportion, is a common cause of difficulty. The average weight of the mature fœtus is, as remarked by Dr. Rigby, from six to seven pounds; but he refers to cases occurring in the practice of Dr. Merriman, Sir Richard Croft, and others, in which the fœtus weighed fourteen, fifteen, and nearly eighteen pounds at the time of delivery. When, in these cases, the bones of the head are ossified as much as usual, the difficulty is often very great. The largest children I have met with in practice have been in cases where, from pendulous abdomen, the fœtus had been retained beyond the full term, and in such cases the difficulty is increased by the weak action of the abdominal muscles during labour. The obstruction produced by increased bulk may be in some degree estimated by the fact that the slight difference between the size of the male and female at the time of birth, greatly increases the rate of mortality, in the case of males, both to the mother and child. In extremely rare cases, the whole of the articulations have been ossified to such an extent as to interfere with the passage of the child. Sometimes the cranial bones are prematurely ossified, so that the bones are as firm and the sutures as consolidated at the time of birth as they should be at four or five years of age. From cases of this kind which have fallen under my observation, I suspect, as I have mentioned in another place, that this may be one cause of idiocy, by mechanically preventing the development of the brain.

In twins, there is generally considerable difficulty and delay in the birth of the first child. The presence of the second fœtus causes the uterus to act upon the first at a great mechanical disadvantage. Labour in twins and triplets in the human female is somewhat similar to delivery in cases in which animals bring forth several young at a birth; but, as I have formerly remarked, there is not in the uterus and vagina of the human subject the same facilities for the descent and expulsion of successive children. In some cases, shortness of the funis, or twisting of the cord round the fœtus, forms an impediment to labour. Naegelé and some other authorities have doubted that shortness of the cord can act in this way. Plenty of cases are on record, however, in which difficult labour occurred in connexion with shortness of the funis. If the cord, as is sometimes the case, is only so long as to suspend the fœtus *in utero*, there must be a difficulty in expelling the fœtus, even if the fundus uteri follows the child, since the fœtus is curved and bent *in utero*, but is extended during its way through the maternal passages. Dr. Rigby relates a case in which the cord was little more than two inches long, and in which it was ruptured during the birth of the child. Probably shortness of the cord is a predisposing cause of inversion of the uterus. Rigidity of the membranes is a common but easily remediable source of delay in labour. They are, however, sometimes so tough, that no efforts of the uterus can rupture them, and they require artificial puncture. We are in want of some efficient instrument for puncturing the membranes, as the finger-nail is a very clumsy and sometimes embarrassing method, and moreover the scalp of the child sometimes gets damaged by its use. Probably an instrument constructed on the principle of that used for puncturing the membrana tympani would be the best that could be devised for this purpose.

Dr. Simpson mentions a condition of the child depending on accidental misplacement of the arm, which offers a considerable impediment to labour, and which he supposes may not be an uncommon cause of obstructed labour. (Fig. 155.) In the displacement referred to, the arm of the child, instead of resting on the sternum, is turned round the back of the neck. It would be well if accoucheurs meeting with such cases should put them on record.

FIG. 155.



Accidental displacement of the arm.

CHAPTER XXXV.

TARDY AND PRECIPITATE LABOURS.

In a great number of the difficult cases of midwifery, we have to deal either with Excessive or Deficient Action of the Uterus and of those organs which are associated with the womb in childbirth. Sometimes this excess or deficiency depends upon other causes than the uterus itself, but in a great number of cases, inertia or excessive activity of this organ play important parts, and it will be very useful in a practical point of view to consider the nature and tendencies of the two great and opposite classes of difficult labour thus produced. They throw mutual light upon each other, when we study attentively their nature and causes, and the several accidents and complications they tend to produce.

Twenty-four hours is the time which has been accepted with nearly common consent amongst accoucheurs, as the limit beyond which a strictly natural labour should not pass. It is, however, equally agreed that little or no mischief can be caused by any ordinary extension of time in the early stage of labour, before the os uteri has dilated widely, and before the membranes have broken. The vast majority of labours are finished much within the time mentioned, especially in multiparous women, but individual cases are met with in which labour extends beyond twenty-four hours without any other morbid element saving that of simple protraction. Still the statistical inquiries of Dr. Simpson and others have proved to a demonstration that a large proportion of fatal and dangerous results, both to mother and child, is met with in cases in which labour is prolonged over the natural time, and the extent of this mortality increases according to the time to which the protraction of the labour extends. On the other hand, excessively rapid labours have their peculiar risks to the mother and child, though this class of dangerous labours is much less numerous than that depending upon protracted labour. In both protracted and precipitate labours, other matters play important parts, besides the activity and excessive action of the uterus; but the state of the uterus and expelling powers, in these cases, is sufficiently important to merit our special study.

In the chapter on the Nervi-Motor Actions of the Uterus, the nature of the expelling powers which accomplish the act of parturition has been entered upon pretty fully. The causes which interfere with these powers, so as to produce parturient inertia or excess, are very numerous and varied. Upon their proper comprehension, our means of relieving the inactivity or violence of the organ will very much depend. Let us then, in the first instance, consider the subject Tardy Labour, from inertia of the uterus, and other parturient powers.

In some constitutions, particularly those of lymphatic habit, the action and development of the uterus is naturally feeble. General debility during pregnancy, or at the time of labour, from whatever cause arising, produces inactivity of the uterus and the abdominal muscles. The uterus acts more feebly in hot than in cold climates, in the heat of summer than in winter; and some of the most distinct cases of uterine inertia to be met with in this country occur in women who have been enervated by long residence in the tropics. Age is another source of deficient uterine action. When a woman becomes pregnant for the first time towards the close of the child-bearing epoch, the pains of labour are less powerful than in the case of a younger female. In the cases I have seen of precocious pregnancy, when very young girls have become mothers, the labours have been tardy, and the pains less powerful than natural. It is also found, that in women who have borne many children in rapid succession, the powers of the uterus decline during the later labours. This is contrary to what occurs in the history of any other muscle of the human economy, and many observers of the fact have been puzzled to explain it. If, however, we take into account the gradual development of the nuclear muscular structure in the virgin, its gradual decline towards and after the end of the child-bearing epoch, and the circumstance that a new set of fibres have to be produced in the gravid uterus in each successive pregnancy, we shall readily understand why the organ of the very young gravid woman, of the patient becoming pregnant for the first time late in life, or of the multiparous woman, whose uterus has been developed and redeveloped a great many times in the space of a few years, should not be according to the most perfect type. The state of the mind in controlling uterine action is also very remarkable. The Protean influence of emotion may act as a powerful oxytocic, or it may entirely suspend the uterine action. The unexpected entrance of the accoucheur, the receipt of some sudden intelligence, a thunder-storm, or, in fact, any emotional disturbance whatever, may arrest labour in mid-career, and it may be some hours before the action of the uterus is resumed. I have seen on more than one occasion, chloroform produce tardy labour, by weakening, or for the time arresting, the action of the uterus.

Various matters relating to the position of the uterus, and the condition of the parts which are indirectly concerned in the uterine efforts, have a tendency to prevent their full development. The effects of the position of the womb are so remarkable as to have attracted the attention of the best obstetricians. In the ordinary uterine position, at the commencement and during the progress of labour, the axis of the uterus coincides with the axis of the inlet of the pelvis. In anteversion from a pendulous state of the abdomen, this correspondence between the axes of the uterus and of the upper part of the canal is destroyed, and the organ acts at a great disadvantage. The force exercised by the uterus is in the direction of its own axis, and, in anteversion, this urges the presenting part of the child, not into and through the pelvis, but against the promontory of the sacrum or the last lumbar vertebra. Under these circumstances, the action of the uterus is inefficient, and it is, moreover, less powerful than ordinary. In those rare cases of partial retroversion which continue up to the time of childbirth, the uterus also acts at a great mechanical disadvantage. Such is also the case when, from rigidity of the abdominal parietes, the use of tight stays or bandages, or other causes, the position of the gravid uterus is more vertical than it ought to be. In both retroversion and in the more common vertical derangement of the uterine axis, the imperfect pains urge the head or presenting part of the child, not into the pelvis, but against the pubic arch. Wigand has accurately described and figured these displacements as a cause of tardy labour. He shows that part of the difficulty in the case of dwarfs arises from the necessary anteversion of the gravid uterus. These results are also increased or diminished by the position assumed by the patient during labour.

In the erect position, or when the patient lies on her back, any tendency to retroversion or a vertical position is increased. When the axis of the uterus approaches the vertical direction, the woman will often instinctively lie on her side, and bend her body forwards; or, if in the upright position, she will stoop, so as to bring the axis of the uterus into correspondence with the axis of the pelvic inlet. It is the province of the accoucheur in all cases to bear these facts in mind, and to act upon them, so as to produce the proper physiological coincidence between the axis of the expelling organ, and the bony canal which the fœtus has to enter and pass. That common form of obstructed labour in which the anterior lip of the uterus descends before the head, and is squeezed for hours between the pubis and the head of the child, is, in the majority of cases, connected with anteversion, and the direction of the aperture of the os towards the upper part of the sacrum. The remedy for this state of things consists more in rectifying the anteversion in the early part of labour, than in any pressure or manipulation of the os uteri itself. In cases of anteversion when the head or other presenting part is driving against the upper part of the sacrum, placing the patient on her back, or supporting the uterus with an abdominal bandage, will bring the uterus and pelvis into harmony with each other, and a fœtus which no power could move onwards while the malposition of the uterus continued, now enters the pelvis with ease. The anteversion of the uterus is sometimes caused, not by mere relaxation of the abdominal muscles, but by a positive breach in their structure, as in cases of large umbilical hernia, in which condition the inertia of anteversion, and the want of the normal support of the uterus by the abdominal muscles, should always be foreseen.

Labour is observed to be slow and tardy in cases of double or bicorned uterus. This malformation, as formerly shown, is an approach to that which obtains in the lower animals as the normal condition of the organ. In this anatomical state of the womb, it is found to be thinner than in the perfect uterus of the human female. With the lower animals, the thin, bicorned uterus has no powerful action during parturition. Its function is to bring the fœtuses to the os uteri, where they are successively grasped by the powerful muscular structure of the vagina, and the great work of delivery is gradually effected by the vagina. When the human female has the uterus after the imperfect duplex type, the vagina being with her an organ of little parturient value, and the obstructions incident to the human pelvis being in full force, labour is performed under great disadvantages; the action of the uterus especially is liable to be imperfect, and easily exhausted or ruptured.

Inflammation of the uterus, rheumatism, gout, and neuralgia affecting the organ, sometimes retard labour to a considerable extent. The excessive suffering produced by the pains prevents their full development. Besides the positive feebleness or inertia of the uterus produced by the various causes which have been enumerated, labour is often retarded by partial contractions of the uterus. The uterus contracts under such circumstances in a spasmodic and irregular manner, or, instead of the uterus, the abdominal muscles, or the muscles of the inferior extremities, are thrown into a state of spasmodic or cramp-like contraction at each pain. The great cause of this state of things, as formerly shown by Dr. Power and other obstetricians, is intestinal irritation.

The course of labour should run in a certain definite and regular manner. At first the actions are simple, and the uterus alone is concerned. As it proceeds, it becomes more complicated, and the nervi-motor actions are more intense. The uterus, under the stimulus of labour, becomes more and more powerful, until it accomplishes delivery. But if balked in its natural course, the uterus and associated organs are very apt to fall into a state of partial inertia. Thus, a dose of opium, or too early rupture of the membranes, occurring either spontaneously or by the act of the accoucheur, will often impede labour for many hours. The same thing happens when the membranes remain too long unruptured. The uterus now refuses, as it were, to go beyond the stage of dilatation, while the liquor amnii is retained. Although as a general rule the early rupture of the membranes retards labour, cases occur in which the premature evacuation of the waters increases the uterine efforts. These cases occur in women when the quantity of liquor amnii is very small, and when the puncture of the membranes at once brings the solid parts of the child in full contact with the uterine parietes; or in cases of distension of the uterus by excess of the amniotic fluid, where the action of the uterus is simply impeded by over-distension.

In some patients labour is retarded in the propulsive and expulsive stages, not only by the withdrawal of any effort of volition which could aid the process, but by a perverted voluntary interference with the natural course of the pains. If, in the stage of dilatation, women are permitted to make voluntary efforts, they become fatigued when the voluntary efforts are really required. In the stages of dilatation, the reflex and voluntary efforts should partially or entirely close the glottis, so that the distended thorax may act as a fixed point for the efforts of the voluntary muscles; but some women delay labour by excessive timidity, opening the glottis during the whole of the pains, refusing all voluntary effort, and thus causing lingering, or comparatively powerless labours.

Uterine inertia may supervene in the course of a labour which has commenced in a natural manner, and proceeded to a certain extent in the ordinary course. The uterus is apparently not strong enough to continue its contractions, grows more and more feeble, and at length comes, as it were, to a dead stop. After an interval of rest, it acquires a new supply of nervi-motor power, and the pains return in some cases, but in others they are not resuscitated, and the patient, if left to herself, would pass through the symptoms of arrested labour, and die undelivered. Entire and persistent failure of uterine action is always a sign of a state of considerable danger to the lying-in woman. The pains have acted in the nature of shock to the system, and when labour is uncompleted, the fœtus remains in the passages, pressing on the hard and soft parts of the mother, and constituting a grave source of constitutional irritation and peril. Although the child no longer irritates the nervi-motor apparatus of the uterus and the rest of the parturient canal, so as to excite motor action, it is a powerful irritant to the vascular and other tissues with which it is in contact. The natural secretions are arrested, the parts become hot and dry, tumefaction of the soft structures occurs, sanious and fœtid discharges are set up, sloughing occurs, and unless rescued from this state, the woman perishes from the combined effect of the shock to the nervous system incident to labour, and the irritation and exhaustion produced by the presence of the fœtus in the parturient canal. In these cases, the shock is felt far more than in cases of healthy labour, and there is something peculiarly noxious to the system in the presence of the fœtus in the passages in a half-delivered state, if left without assistance. This state of things probably belongs to the past, and to the age of the ignorant midwife, rather than to the present day, and we may congratulate ourselves that such cases are now only seen as rare exceptions. We may hope and expect that, in the progress of obstetric knowledge, the death of women from the exhaustion consequent upon lingering labour, where the muscular powers are at fault, but where no insurmountable mechanical difficulty exists, will become impossible.

One class of tardy labours depends on faulty action of the expelling powers which act in harmony with the uterus. A variety of causes interfere with the voluntary and reflex action of the respiratory muscles. In cases of labour occurring in phthisical patients, and various diseases of the lungs, such as bronchitis, pneumonia, and pleuritis, the distension of the chest, closure of the glottis, and powerful expiratory actions of respiratory muscles, are all impeded. Sometimes labour comes on at the natural term in chronic pulmonary disease; in others, the lungs are the subject of acute disorder, and labour is excited by the local disease. In both, particularly the latter, labour is impeded, painful, and most distressing to the patient. In paraplegia, the parturient woman is cut off from the aid of voluntary and reflex respiratory action. In the various forms of cardiac disease, and in abdominal maladies, the auxiliary powers which aid the uterus in the propulsive or expulsive stages, can only be brought into operation in a very imperfect manner. In a former chapter I have spoken of ovarian and fibrous tumours as offering mechanical impediments to the passage of the child. In cases where these tumours are above the pelvic brim, the actions of the uterus and of the abdominal muscles are interfered with by the pressure and bulk of the tumours. The respiratory actions of labour are necessarily imperfect in ascites and in ovarian dropsy. General plethora, and in particular a fatty state of the omentum and abdominal parietes, also frequently interfere with both uterine and respiratory action.

The prevention of tardy labour will be best insured by preserving the course of parturition in as natural a track as possible. With this end we should attend to the time at which the liquor amnii escapes, aim at a proper harmony between the axes of the uterus and the pelvic inlet, encourage the voluntary efforts at the proper stages, and discourage them before the full dilatation of the os uteri; avoid opiates or sedatives of uterine action when there is any apprehension of feeble labour; remove intestinal or gastric irritation by an aperient or enemata and encourage vomiting; preserve the confidence and mental tone of the patient; and give moderate and sustained support and stimulus during labour, particularly in the early stages.

In tardy labour, the pains are more powerful in the upright than in the recumbent position, and the patient may be encouraged to walk about and to stand up, leaning on a chair or supported by the nurse, during the pains. An abdominal bandage will often have the best effects, apart from any influence in correcting anteversion, by supporting the abdominal muscles and exerting the stimulus of pressure upon the uterus. Vomiting, sneezing, coughing, the action of the bowels, all tend to excite the uterus; and the administration of a brisk, purgative enema is often most effective in rousing the uterus from a state of atony or torpor. I have formerly mentioned that the examinations of the accoucheur have a tendency to excite uterine contraction. In powerless labours, digitation should be more freely resorted to than in other cases; and when making examinations, firm pressure should be made on the perinæum, this being the seat of a considerable number of excito-motor nerves in relation with the uterus.

When labour is arrested in mid-course, or towards its termination, the uterus and its associated muscles often begin to act again after a short interval of rest. In cases of this kind, great good is sometimes done by a full opiate, particularly in cases where the preliminary part of labour has been tedious, and the patient has long been without sleep After a few hours' rest, the uterus will resume its work with energy, and the patient, refreshed by repose, will go on favourably to the termination of labour. Such cases must, however, be carefully distinguished from those in which exhaustion of the body generally, and of the uterus in particular, has been induced to such an extent as to be beyond the power of restoration by temporary rest, and which rest from the pains, before the completion of delivery, is a deceitful truce, in itself an exhausting and dangerous condition to the patient.

Cases of retarded labour from the disease of other organs, particularly the lungs and heart, require to be treated with reference to the extra-uterine disorder. I shall have to discuss, when treating of the induction of premature labour, the propriety of artificial delivery in cases of the occurrence of acute pulmonary disease in the latter part of pregnancy, and also in cases of chronic heart disease. During the occurrence of actual labour, under these circumstances, all we can do is to avoid every unnecessary exertion or excitement. I have already mentioned that, in cases of inflammatory disease occurring to the gravid woman, the symptoms are preternaturally acute, and generally require decisive treatment. When the uterus is inactive from inflammatory, rheumatic, or gouty disorder, bleeding and antimonials are required.

In entire arrest of labour from failure of uterine action, when nothing is hoped from rest, we have to resort to oxytocic remedies, or to instrumental delivery. Ergot of rye, galvanism, borax, and cinnamon, are the chief agents by which we can act upon the uterus. I propose, however, to devote hereafter a chapter to the special properties of Oxytocic remedies. The ergot is of all the most powerful and certain, and in half-drachm doses of the powder, infused in boiling water, and taken every ten minutes, to the extent of three or four doses, it will generally excite the uterus, unless the tone of the organ is entirely exhausted. On account of the spastic contraction of the uterus, caused by this medicine, which interferes with the utero-placental circulation, and perhaps also from some specific influence upon the circulation of the fœtus, the state of the child should always be watched while the mother is under the influence of ergot, and delivery completed by the forceps, if the action of the fœtal heart is quickened to any great extent. In uterine inertia, as in all other cases, the os uteri must be dilated, or readily dilatable, before the ergot can be given with safety, and there should be no extra-uterine impediment to delivery. The ergot is especially suited for those cases of uterine inertia in which rapid delivery is not called for, and when the head of the child is not low down enough to render the application of the forceps easy. Dr. Vernon, the late very able obstetric resident of St. Mary's Hospital, has recently given small doses of strychnia in cases of labour marked by pure uterine atony with good effect.

Where the symptoms are urgent, as regards either the mother or the child, particularly the former, the long forceps or turning when the head is at the brim, or the short forceps or vectis when the head is sufficiently low, are called for; and in extreme cases of danger to the mother, craniotomy becomes necessary. In cases where the child is already dead, and cannot be delivered speedily by the forceps or turning, the operation of craniotomy and extraction by the crotchet should be performed. A train of serious symptoms often follows upon deliveries marked by uterine inertia. These will have to be considered separately, the most important of them being non-detachment, or non-expulsion, of the placenta, and post-partum hæmorrhage.

We have next to consider the opposite state of things, or Precipitate Labour, chiefly from violent or excessive action of the uterus and its associated muscles.

The great majority of precipitate labours depend upon the constitution and temperament of the mother. As some women and some families always have slow and lingering labours, so others invariably complete the process in a rapid and powerful manner. Nothing can be more in contrast than the strong parturient action of the moderately well-fed, hard-worked, and exposed woman in agricultural districts, and the more feeble powers of the denizen of large towns of the same rank. Fortunately, with the diminished power, there is also diminished resistance from relaxation of the tissues, otherwise difficult labour would be far more frequent than it is in such cases. In the robust countrywoman the resistance to be overcome increases, to some degree, in proportion to the strength and excitability of nerve and muscular fibre. In women of powerful nervous and muscular endowment, under any circumstances, labour sometimes becomes almost tetanoid in character.

It is observed that women who have been the subjects of dysmenorrhœa suffer from painful and violent labours, probably from the persistence of ovarian excitement up to and during the process of parturition. Some women, particularly hysterical subjects, increase the pains of labour to a dangerous extent by passionate and uncontrollable voluntary efforts during the stages of propulsion and expulsion. Dystocia of this kind may also depend on a small quantity of liquor amnii, when the uterus is well developed, and the nervi-motor powers of the mother active. This is because the body and limbs of the fœtus are from the first in contact with the uterus, and because solid rather than fluid pressure is directed against the os uteri during the stage of dilatation. The early rupture of the membranes, occasionally, instead of retarding labour, brings on a perfect storm of uterine action. Fear, terror, and mental emotion of any kind, will sometimes render labour acute to an extraordinary degree. The most rapid action of the uterus we can conceive, is that in which the child is expelled partly through the influence of terror, in cases of sudden death, as in drowning or suffocation. Under such circumstances, the whole process of delivery, at the full term, has been completed in a few minutes. Here the oxytocic efforts of the carbonic acid retained in the blood, concurs with mortal anguish, and the act of dissolution itself, in evacuating the womb. In the febrile condition and blood-poisoning which obtains in small-pox and scarlet-fever, and albuminuria, labour is sometimes unusually rapid from excessive uterine action. It is scarcely necessary to refer to the injudicious administration of the ergot of rye as a cause of precipitate labour. Cases of rapid labour from the great size of the pelvis belong altogether to a different category from that we have now been considering. In these cases then, the celerity with which delivery is completed depends on diminished mechanical resistance to the passage of the child.

The Management of precipitate labour consists in the avoidance and removal of its causes, and the employment of palliatives of uterine action.

The position of the patient in cases of acute and violent labour should be the recumbent from the first. Mental and physical stimuli of all kinds should be avoided as much as possible. No examinations beyond those actually necessary to ascertain the presentation of the course of labour, and to aid the passage of the fœtus through the external parts, should be made. In cases of constipation and fæcal accumulation in the rectum, the bowels should be cleared by mild enemata. When the uterine action is increased, and aided by the uncontrollable volition of the patient, the remedy consists in encouraging her to cry out lustily, during which all voluntary action is impossible. It was a pious fraud recommended by Denman, to tell the woman, in the latter part of labour, that the child was already born, when she was in danger of laceration, and thus to make her cease from the struggle of expulsion, as far as volition was concerned. Venesection, nauseating doses of tartar emetic, a full opiate, or chloroform, are the most powerful sedatives of uterine action which we possess.

The train of evils produced by precipitate and irregular labour is scarcely less dangerous than that following in the wake of tardy labour. Amongst the accidents produced by excessive or discordant uterine action, we have rupture of the uterus, laceration of the perinæum, retention of the placenta from closure of the os uteri, hour-glass contraction, inversion of the uterus, and prolapsus and procidentia. In rare cases, when the pelvis is large or the child small, the violent uterine and abdominal action brings down the uterus, and we have procidentia during the act of labour. Such cases require careful support of the uterus by the hand or a bandage, to keep the mischief as limited as possible. It has also been observed that puerperal mania has a tendency to follow precipitate labours. In some cases apoplexy or convulsions are caused during the violence of the pains. In precipitate labour, the state of the child must be carefully attended to. The incessant uterine action sometimes destroys it by asphyxia, from arrest of the utero-placental circulation. The fœtus is occasionally extruded with such violence as to snap the umbilical cord; this is particularly likely to occur in such cases when the mother is allowed to be delivered in the upright position. Under the same circumstances, the child may be seriously injured by being shot out with violence upon the floor. I once knew a case of precipitate labour in which the patient, not supposing delivery to be near, insisted upon going to the water-closet, and the child, being suddenly discharged into the pan, had to be rescued from the peril of death from drowning, as well as mechanical injury. On a former occasion this patient had dropped or expelled the child upon the floor, while standing at the bottom of the bed. Cases of this kind have a medico-legal bearing. It is, of course, of the highest importance to distinguish between cases of accidental birth of the child, while the mother is at the closet, and premeditated infanticide.

CHAPTER XXXVI.

POST-PARTUM HÆMORRHAGE.

There is scarcely an occurrence in the whole range of obstetric practice more alarming or dangerous than Flooding after the birth of the child. This tragic complication of labour often happens, too, when the patient is supposed to be free from danger, and when the accoucheur, fatigued by a long attendance, is congratulating himself upon the completion of his duties. There can be no contingency in which the life of the patient depends so completely on the coolness, decision, and promptitude of the attendant. Nothing, indeed, can more thoroughly tax his highest skill, and the whole of his resources, than the spectacle of a woman in imminent danger of death from this form of hæmorrhage.

Let us, in the first instance, consider the circumstances under which patients are predisposed to this accident. The chief sources of flooding—namely, the open mouths of the veins on the internal surface of the uterus, from which the placenta has been separated, have already been pointed out. It has also been shown that the great natural defence against hæmorrhage lies in the efficient contraction of the uterus after delivery. Whatever tends to enlarge the venous openings, or to prevent the contraction of the whole organ, necessarily tends to the production of hæmorrhage. Thus, a large placenta, from the greater size of the utero-placental vessels, gives the tendency to flooding. For the same reason, post-partum flooding, after delivery at the full term, is far more dangerous than hæmorrhage occurring after premature labour. The circumstances which interfere with efficient uterine contraction after delivery, or produce inertia, are many of them the same as those which lead to powerless labour. Post-partum hæmorrhage is, in fact, one of the sequelæ of uterine inertia. Amongst these circumstances are, a general relaxed habit of body, weakness of the abdominal muscles, and umbilical hernia. Such conditions are frequently found in the greatest degree in women who have resided in tropical climates. They occur also in women who have borne large families, as explained when treating of uterine inertia. The uterus often flags when labour has been long delayed from any cause, whether the womb be simply inert, or worn out by prolonged action. Thus the organ frequently refuses to contract after labours in which the forceps or craniotomy have been required. The same result may sometimes, but far less frequently, spring from exactly opposite causes. After a very rapid labour, or after the extraction of the body immediately upon the birth of the head, the uterus may suddenly fail. In these cases it has not been fully and gradually roused to that powerful state of contraction which ensures the safety of the mother after delivery; or too suddenly becoming empty, it refuses to contract, just as we sometimes witness to be the case after the sudden evacuation of the liquor amnii in the beginning of labour. I have pointed out that, in labours occurring in women suffering from albuminuria, the womb often remains flaccid after delivery to such an extent as to cause dangerous hæmorrhage.

The Symptoms of post-partum hæmorrhage are those which belong to the uterus itself and the local loss, and those arising from the effects of loss of blood upon the system. The hæmorrhage may occur before the expulsion of the placenta, and immediately after the birth of the child, the placenta being detached, but remaining *in utero*, or in the vagina; or it may not take place until the after-birth has been expelled. The most sudden and profuse losses are those which occur when the placenta, having separated without being expelled, distends the uterus, and enlarges the area from which the blood escapes. The first sign we have of hæmorrhage may be a gush from the uterus, and the accoucheur first learns the contingency he has to deal with, by hearing the plashing of the blood upon the floor. I may here mention a circumstance which sometimes alarms us unnecessarily. In cases where the head of the child has so accurately fitted the passage as to act as a ball-valve, the principal part of the liquor amnii remains, and gushes out after delivery, mixed with the blood effused upon the separation of the placenta by the pains which have expelled the child. When the hot stream comes upon his hand, the accoucheur may suppose it to be hæmorrhagic, but the eye soon distinguishes the real state of things. Where the hæmorrhage occurs immediately after delivery, the gush of blood is sometimes enormous, the uterus and vagina are dilated, and there being no impediment to the free escape of blood externally, the clothes of the patient and the bed are drenched with blood. Sometimes the mischief is hidden, and an immense quantity of blood may escape from the uterine vessels without any discharge externally. The body of the uterus is dilated, but the os is contracted, or plugged with coagula, and the blood accumulates in the uterine cavity. Under these circumstances, the body of the organ remains in a state of almost persistent atony, not the slightest effort at contraction is made, and as a muscular organ it is for a time in a state of perfect paralysis or death. When the abdomen is examined by the hand, the womb is felt to be large, soft, and flaccid, and altogether unlike the dense organ in a state of normal contraction. In other cases, the hæmorrhage may be intermittent. There is marked relaxation of the uterus, followed by intervals of contraction. During the state of dilatation, little or no blood appears externally, but gushes of blood or coagula take place every time the uterus contracts. In such cases, the uterus is felt externally to be in a state of alternate relaxation and contraction, the contractions, especially, being attended by severe pain. Sometimes great agony, without efficient muscular contraction, is felt while the uterus is being distended by coagula. There are yet other cases, in which the uterus contracts moderately, but in which there is a constant and dangerous oozing of blood. It has been said by some authorities, particularly by Gooch, that hæmorrhage may co-exist with powerful contraction of the uterus. But this is not to be received without much reservation. In such cases there is generally a retention of some portion of the placenta. It can hardly occur without some such condition, and probably Gooch was misled by cases of intermittent contraction, in which, during the flow, the uterus is often felt to be hard and firm. With the cavity of the uterus free and uninjured, and continuous contraction present, dangerous hæmorrhage from the venous sinuses is a mechanical impossibility; and it weakens our faith in the great means of arresting hæmorrhage, to believe that contraction and hæmorrhage can occur together, save under exceptional circumstances. Fulness of the circulation was formerly supposed to be a cause of hæmorrhage, the blood escaping in large quantities from the exposed extremities of the uterine arteries, after the entire or partial separation of the placenta; and bleeding from the arm was at one time advised and practised as a remedy, under the idea of diminishing the momentum of the current from the heart. Such cases rarely, if ever, happen to such an extent as to cause uneasiness, at the present day, and few persons would now dream of venesection in post-partum flooding. If such a remedy could be necessary, it is too surely in operation, from the hæmorrhage itself. Minor hæmorrhages may occur from limited lacerations of the os uteri, the vagina, and the perinæum, but these are seldom, if ever, attended by danger. Occasionally, flooding occurs to a considerable extent some hours or several days after the completion of delivery. When this occurs, it is probably similar to the losses which occur in menorrhagia. After labour, as formerly shown, the whole of the decidua is thrown off from the internal surface of the uterus, leaving a large surface from which the blood constituting the lochial discharge exudes. We can easily understand that profuse lochial flooding may occur from the detachment of masses of decidua, when we consider the larger superficies of the uterus after parturition, and that its internal surface is in much the same state as that which obtains during menstruation. The tendency to loss of this kind is necessarily increased by flaccidity, or large size of the uterus. These conditions, or the detachment of portions of placenta which have remained *in utero*, give rise to the floodings under consideration. In the cases where the lochial discharge has continued for several weeks after delivery, I have frequently found the loss to depend on laceration or abrasion of the os uteri; the blood exuding chiefly from the surface of the os and cervix, as in the majority of cases where the spurious menstruation of pregnancy exists.

The Effects, of the loss of blood are most appalling to witness, and would require a dramatic pen to do full justice to their portraiture. In the most formidable cases, the great mass of the blood may be withdrawn from the body in the space of a few minutes. The woman may suddenly fall into a mortal syncope, from which she never recovers. When the effects are more gradually induced, the pulse becomes very rapid, feeble, and irregular, or fails, or is not to be detected in the limbs; the respiration becomes gasping and diaphragmatic, the patient crying wildly for air; she loses her sight, and complains that everything about her is dark. Sometimes jactitation is present, and she tosses her arms and limbs about wildly, and with such violence, as to exhaust her remaining strength; at others, she manifests an almost irrepressible desire to sleep, when, if permitted, her repose would be the sleep of death. Vomiting frequently occurs: sometimes convulsions are produced; the surface of the body, especially the extremities, are cold, and bedewed with sweat; and a paleness exceeding all others, which may be termed the Puerperal Pallor, almost represents death itself. The symptoms I have mentioned, if permitted to continue, are the sure evidences of a state of the utmost peril, or the harbingers of dissolution itself. When the patient perishes, it is either from successive syncopes during the course or shortly after the arrest of the hæmorrhage, or she dies by the process of gradual sinking some hours or even days after labour. The danger of the patient must be estimated from the symptoms as much as from the amount of blood actually lost. Some women die after a very moderate loss, while others bear flooding to an immense extent, and recover with great rapidity.

The first point in the management of post-partum hæmorrhage relates to its Prevention. Where there have been any circumstances connected with the labour, which lead us to fear hæmorrhage, one or two doses of ergot should invariably be given during the last pains which expel the child, or immediately after its expulsion, and before the extraction of the placenta. This plan should always be followed in cases where women have, as is sometimes the case, suffered from flooding in several successive labours. Immediately after delivery in suspicious cases, the hand should be placed upon the abdomen, and kept there until efficient contraction is felt to have taken place. An abdominal bandage should be placed lightly round the body, before the completion of labour, so as to have it ready if necessary without disturbing the patient. The horizontal position should of course be strictly preserved. Sleep, immediately after labour, should not be permitted, and the vulva should from time to time be examined, to learn the amount of discharge. As soon as the uterus is found to have contracted, the abdominal bandage, with a compress of two or three folded napkins, should be applied. I have known cases where I have been obliged to attribute a fatal result from hæmorrhage to the neglect of bandaging after delivery. After the hæmorrhage has ceased, and in prolonged cases, even before this event, the action of the bandage is far more efficacious than pressure by the hand, or it may be combined with the use of the hand, as the bandage not only stimulates the uterus, but replaces the pressure of the gravid uterus.

In the Treatment of post-partum floodings, we have two things requiring instant attention, one being the arrest of hæmorrhage by uterine contraction,—the other, the sustentation of the patient under the immediate and remote effects of loss of blood. As I have pointed out in my work on Parturition, we have a good many powers to appeal to for inducing uterine contraction. There is the reflex contraction of the uterus, as when we dash cold water upon the vulva or abdomen. There is the direct spinal excitation of the uterus, when we act, not upon the excitor nerves of the surface of the body, but upon the spinal marrow itself,—as when we give ergot. There is the peristaltic action of the uterus and the contraction depending upon muscular irritability of the uterus itself, which we call into operation when we manipulate the uterus externally, or introduce the hand into its cavity, or excite it by galvanism. We can also imitate contraction of the uterus, to some extent, by mechanical compression; and we can exert pressure upon the great vessels through which the blood is poured into the uterus before its escape from this organ. In practice, we should combine as many of these modes of action as may be necessary.

In the worst cases of post-partum flooding, the uterus should be grasped and held firmly by the hands, through the abdominal parietes. This excites the peristaltic and reflex action of the uterus, and compresses the organ mechanically. When the uterus is got well under control in this manner, flooding to any great extent is impossible. Several doses of the ergot should be administered in quick succession, and cold—or, if in summer, iced—water, when it can be obtained, should be dashed upon the vulva and abdomen. Douching with a wet towel, or a stream of water from a height, upon these parts, is very effectual in rousing the uterus to contraction. The time during which it is necessary to grasp the uterus is often very considerable. When these means fail of entirely arresting the hæmorrhage, the hand should be introduced into the uterus, and its internal surface excited by the knuckles of the closed hand. I have not the same dread as many accoucheurs have of introducing the clean hand into the uterus, and, as I have once or twice insisted on in the present work, I believe, in the present day, more mischief is caused from a kind of fear of the uterus, and of interfering with its natural action, than from bold and intelligent efforts to guide and control it. The hand should always, if possible, be washed before its introduction. With the hand in the uterus, it becomes more easy to grasp and compress the organ externally. As an addition to the introduction of the hand, where the uterus is felt to be in a state of atony or paralysis, or when its intermittent action is feeble, and occurs at long intervals, I have injected cold or iced water, in a full stream, into the cavity of the organ, and in this way I have several times rescued women from an apparently hopeless condition. I have had no experience of the effects of galvanism in post-partum flooding, but where there was time to bring it into operation, I should have no doubt of its power. With respect to the modes of using reflex action for the arrest of hæmorrhage, it should be mentioned that cold and heat, alternately, are more efficacious than cold continuously used, even when we inject into the uterus itself. On this principle I have sometimes injected warm and cold water into the uterus with the best effect. It should also be borne in mind that cold is a powerfully depressing agent, and should not be used to such an extent as to weaken the patient. When one reflex surface is exhausted, we may often appeal to another with great effect. Thus, when cold to the vulva and abdomen has been used so long as to lose its effect, cold sprinkled on the face, swallowing a gulp of cold water, giving a patient a piece of ice to hold in her hands, a cold enema to the rectum, will each in turn excite reflex uterine contraction. Whenever coagula collect in the vagina or in the uterus, they should be turned out by the hand. Clots are a source of great irritation, and their presence tends to keep up hæmorrhage. Their removal alone will often suddenly relieve the patient of severe spasmodic pain, and stop all loss of blood. In cases of hæmorrhage, where the placenta is only partially separated, or where it is detached from the uterus, but retained in its cavity, the placenta should always be separated and removed gently as early as possible. Some practitioners have recommended, under such circumstances, that we should wait a little when the patient is much exhausted before removing the placenta, on the ground that the operation itself, and the removal of the mass of the placenta, tend to produce fatal syncope. We may wait an instant, while we pour some brandy down the patient's throat, but I have seen much mischief from delay beyond this, and never any harm from immediate and gentle action. We can make up for the removal of mere mass by external pressure, and every inch by which we reduce the size of the womb increases the patient's safety. Pressure upon the aorta and inferior cava has been recommended by many authors. This can more certainly be accomplished when the hand is in the uterus than in any other manner. In extreme cases, Transfusion has been advised, and, when other means fail, I should have no hesitation in recommending and performing it. Some time ago, a lady was under my care in whom transfusion was performed successfully by Mr. Soden of Bath, and, from the nature of the case, I have no hesitation in stating my belief that the operation saved her life. This measure seems particularly suited to cases in which patients are slowly dying, by the process of syncope, some hours after hæmorrhage has ceased.

Dr. James Arnot has recommended an apparatus by which a continuous stream of cold water can be passed over the abdomen in cases of flooding. It has also been suggested that one of M. Gariel's air-pessaries should be introduced into the cavity of the uterus, and distended with a view of arresting the hæmorrhage by distending the uterus. Both proposals are exceedingly ingenious. I have, however, stated the reasons in support of an intermittent rather than a continuous application of cold. The distension of the uterus is altogether wrong in principle, and the more we distended the organ, the more profuse would the hæmorrhage become, unless contraction were present, when of course distension would not be required. In cases where these pessaries can be used in the vagina so as to compress the uterus, I believe they are most useful, but I should be afraid to introduce one into the uterine cavity with such an object as the one proposed.

During the continuance of uterine hæmorrhage of any kind, no stimulus is so useful as brandy. It may be given either pure, or mixed with water, arrowroot, gruel, or beef-tea. In post-partum floodings especially, immense quantities may generally be taken with the utmost benefit. When brandy cannot be borne, other stimuli, such as wine, ether, and sal volatile, should be resorted to with strong beef-tea. It is a misfortune that in some cases there is such an amount of gastric irritability that all stimulus and support is rejected by vomiting. This sometimes happens in hysterical subjects, the hysterical element persisting even in the act of death itself. The act of vomiting is, however, in itself a powerful stimulus to the uterus, when it does not continue to such an extent as to add to the exhaustion. In such cases, small quantities of brandy or beef-tea should be given. The patient should be kept with the pelvis raised and the head depressed, the objects being to retard flooding, and supply the circulation of the brain. Opium is of very great value in the treatment of uterine hæmorrhage. A moderately full dose, to the extent of a grain and a half or two grains of opium, in the shape of opium itself, laudanum, liquor opii sedatives, or the salts of morphia, promotes the contraction of the uterus, although in very large doses opiates allay uterine action. As rapid action is required, an opiate is most effective during or after hæmorrhage, if given in a fluid form. The action of opium in exciting the uterus is, however, of little importance compared with its power of sustaining the nervous and vascular systems, after losses of blood. In this point of view, given alone, or with ether and sal volatile, an opiate is more serviceable than any amount of brandy, wine, or nourishment in any form. The dose should not, however, be excessive or repeated; otherwise, the respiration is impeded by the action of the opiate, and harm rather than good is done to the patient. I have found from experience, that less tendency to syncope is present, when the patient lies on her left side than in other positions. Fresh air should be supplied, as by fanning and open windows, and the patient kept with as little movement of the limbs as possible. After the cessation of hæmorrhage, when the effects have been severe, the patient should not be moved at all for some hours after labour, and she should not be allowed to stand, or to sit up during defecation or micturition, for many days, or even two or three weeks, after labour, and especially after eating a meal. Many patients have died suddenly from exertion of this kind, taken before they had sufficiently recovered from the loss of blood. When patients have been very much reduced by hæmorrhage, considerable discretion is called for in the introduction of food and support into the system. We must not, on the one hand, push too much nourishment rapidly, otherwise we distend the weakened vessels, and may incur the risk of apoplexy; or, on the other hand, starve the patient, or we perpetuate the state of anæmia.

There is an after-train of symptoms arising from loss of blood, consisting of reaction, particularly affecting the heart and brain, which to some extent imitates active disease. There is violent palpitation, acute pain in the head, violent throbbing of the carotids, and intolerance of light and sound. Great care must be taken not to treat such symptoms by local or general blood-letting, as has sometimes happened. A good diet, stimulants, steel, and tonics, for a continuous length of time, are required in such cases.

CHAPTER XXXVII.

RUPTURE OF THE UTERUS.

This is among the most fatal of all the accidents which attend the processes of gestation or delivery, but fortunately it is of rare occurrence. Dr. Fleetwood Churchill has collated 113,138 cases of labour, out of which number it occurred in 85, or about 1 in 1331.

Any part of the uterus may be the seat of laceration. It occurs more frequently at the junction of the os and cervix with the vagina than at any other part, and it is more common at the anterior or posterior surfaces of the lower segment of the uterus than at the sides of the organ. It may occur at any part of the fundus or body of the uterus, or extend throughout its whole length. Sometimes a rent is made in the cervix, without extending to the rim of the os. In rare instances, the laceration extends to the bladder. Several cases are on record, in which the laceration has been circular in form, and has completely separated the os and a discous portion of the cervix, from the rest of the organ. Occasionally, the lacerations are incisiform and numerous, being found immediately under the peritoneal surface; and it has occurred that all the symptoms of ruptured uterus have been caused by separation of the peritoneum from the uterus, and sub-peritoneal effusion of blood, without any actual laceration of the fibres of the uterus. In other cases, the muscular structure has been torn, the peritoneum remaining uninjured. The reason of the great comparative frequency of the lacerations at the os and cervix is readily understood. It is in this situation that the great amount of the extending forces of the uterus, and the distending forces of the fœtus, are brought to bear in parturition. The reason of the sub-peritoneal lacerations will also be understood, if we bear in mind the anatomical insertion of the fibres of the external layer of the uterus into its peritoneal coat. The shape and the exact direction of the laceration may vary almost infinitely. The edges of the rupture are generally ragged and uneven, and in some cases softened, or even putrid.

Rupture of the uterus occurs in cases where labour has been rapid, and also in cases where it has been protracted. The majority of cases occur, however, in labours which have been under twenty-four hours, and which could not, on account of their length, be classed as preternatural labours. It may happen at any age, but in the majority of cases on record, women who were the subjects of it, have been upwards of thirty years of age. It may be questioned whether this circumstance arises from increased power, or diminished development, of the uterus in women who are advanced in the child-bearing epoch; both causes, no doubt, operate, but probably imperfect development is more frequently concerned as a cause of rupture, than excessive action. The presentation of the child has a considerable influence upon the occurrence of rupture. Out of 303 cases of rupture in all presentations collated by Dr. Trask, 16 were arm presentations, or 1 in 16. As the proportional frequency of arm presentations, compared with other presentations, is only about 1 in 230, we must consider that rupture of the uterus occurs relatively, in a much larger proportion of arm, than of other presentations. On the other hand, only 2 of the 303 cases, or 1 in 151, were breech presentations. As breech cases occur in about the proportion of 1 in 59 of all presentations, we must further conclude that the tendency to rupture of the uterus is less in breech than in other presentations.

It has been stated again and again by obstetric authors that women are less liable to rupture of the uterus in first than in subsequent labours; and by many it is accepted as a proved position in obstetrics, that this accident seldom occurs to primiparous women. Thus, of two of the latest and best authorities, Dr. Fleetwood Churchill and Dr. M'Clintock, the former states that "it rarely occurs with first children," and the latter that "it is a well-established fact, that women in their first pregnancies are very rarely the subjects of ruptured uterus." An appeal to statistics will modify this opinion very considerably. Dr. Churchill gives 75 cases, ranging from the first to the eleventh pregnancies, only 9 of which were in primiparous women. The particular distribution of these cases was as follows:—As already mentioned, 9 were cases of first pregnancy, 14 occurred in the second, 13 in the third, 11 in the fourth, 2 in the fifth, 9 in the sixth, and 8 in the seventh, the remaining 9 cases being divided in smaller numbers amongst other pregnancies. Dr. Trask, of the United States, collected 303 cases, ranging from the first to the seventeenth pregnancies, in which 24 occurred in the first pregnancy and labour, 18 in the second, 17 in the third, 21 in the fourth, 18 in the fifth, 16 in the sixth, and a smaller proportional number in successive gestations. Thus, out of 75 cases given by Dr. Churchill, it occurred in first pregnancies in 9 cases; and out of 303 collected by Dr. Trask, 24 happened in primiparous women. If, on the one hand, we take first labours, and compare them with subsequent labours, all grouped together, no doubt the primiparous is less liable to the accident than the multiparous woman. But if, as is the fair way of putting the case, we compare first labours with second, third, fourth labours, &c., separately, we shall find that the primiparous woman is scarcely, if at all, more exempt than women in second or third labours, &c. Instead, therefore, of saying there is anything like an exemption in favour of the primiparous woman, all which the facts warrant us in stating is, that the uterus developed for the first time is not more likely to become ruptured than in subsequent pregnancies.

The Causes of uterine rupture are, some of them, those circumstances which produce precipitate labour, while others are connected with tardy labour, or depend upon particular conditions of the uterus. Violent uterine action alone, after the rupture of the membranes, when the pelvis and fœtus are of the normal size, may rupture the organ. Before the evacuation of the liquor amnii there is seldom any risk of laceration. The danger of this accident is very much increased where the fœtus is of large size, or where the pelvis is below the natural dimensions. It is liable to happen in quick labours, where the uterine contractions are very powerful, where the child is a little above the usual size, and where the pelvis is only slightly contracted, or where both these conditions meet together. In such cases, the violent contractions tend to tear the os and cervix uteri; the fœtal head contributes to its laceration by distension, and the walls of the organ are at the same time weakened by compression between the fœtal head and the pelvic walls. The sex of the child has a material influence as a cause of rupture. Of 54 cases described by Dr. Collins and Dr. M'Keever, the births were 38 boys and 16 girls. The accident also occurs in tardy labours, when the uterus acts strongly, and when the head is large, as in hydrocephalus, or when the pelvis is deformed to a great extent. In these cases, the most violent and long-continued contractions of the uterus are exerted to overcome the difficulty, and the organ is necessarily bruised by the distorted pelvis and the head of the child. Very much the same state of things is produced by certain mal-presentations, as, for instance, when an arm case is left to nature, and the child gets jammed into the pelvis without hope of escape, with a powerfully-contracting uterus behind it. The same kind of danger of rupture as that which arises from deformed pelvis is sometimes met with in cases of anteversion, when the head is driven against the promontory of the sacrum. Numerous circumstances predispose the uterus to rupture, such as the occurrence of inflammation in any part of the organ, either during pregnancy or at the time of labour. In the unhappy cases in which pregnancy happens during the existence of cancer uteri, and where the patients go to the full term, lacerations almost inevitably occur during labour. It is also caused by excessive rigidity or occlusion of the os uteri, unconnected with malignant disease. Long-continued compression of the organ between the head and the pelvis, in difficult labours, tends to this catastrophe, by producing softening of the muscular structure. A considerable number of the lacerations met with in practice depend, in all probability, to some extent, upon feeble development of the uterus generally, or upon some local weakness of the organ. We must not think of the gravid uterus as an organ which is pretty much the same in all women. The uterus of every woman, and it may almost be said, of every pregnancy, differs to a considerable extent. Nothing can be more dissimilar than the thin parietes met with in one organ, and the strong development found in another. Cases are also met with in which some particular part of the uterus is thinner than in others, or in which the os and cervix have not been properly developed. These cases of preternatural thinness, or of local deficiency, account for those instances which sometimes occur of rupture from the contractions or movements of pregnancy alone, or in which laceration takes place in labours not at all remarkable for the violence of the pains, and where the head and pelvis are of normal size. There can be no doubt that in cases where the uterus is feebly developed, or weakened by disease and exhausted action, the contractions of the abdominal muscles must contribute to the rupture of the organ, by urging the head or presenting part of the child through the os uteri. Recent observations tend to show that the gravid uterus may become the subject of that fatty degeneration which is so largely concerned in its involution, and that this degeneration predisposes the uterus to rupture and laceration. The incautious use of instruments, or their most careful application when the uterus is predisposed to the accident, may cause rupture. Wherever the ergot of rye is given incautiously or improperly, the risk of ruptured uterus is incurred. When given in too large quantities, or when the os uteri is not well dilated, or when the head is larger or the pelvis smaller than natural, there is always danger of laceration. It may even be produced by improper digitation, during the course of precipitate labours. Numerous cases are on record in which the uterus has been lacerated during an examination made at the acmé of a strong pain. There can be no doubt that such irritation of the vagina and the os uteri, and the consequent increase in the force of the pains excited in the form of reflex action, have contributed in such cases to the disaster. The attempt to turn when the uterus is in a state of violent contraction, and when the waters have been long discharged, or the attempt to introduce the blades of the forceps before the proper dilatation of the os uteri, has been known to rupture the organ. Various conformations of the pelvis, apart from mere diminution of size, may lead to rupture, such as exostoses presenting rugged, spiked, or sharp outlines to the uterus, a keen linea-ilio-pectinea, or an acutely-pointed ischial spine. Lastly, external mechanical injuries may produce sudden laceration of the gravid uterus, particularly in the latter months of pregnancy. It has happened from falls, kicks, wounds made with sharp instruments, the goring of bulls, &c. Any form of mechanical violence, apart from labour, may either puncture or incise the organ, or rend its walls asunder. In pregnancy, rupture of the uterus may be caused by mechanical injuries; by those spasmodic contractions of the uterus, referred by the older authors to movements of the fœtus; and by inflammatory disease or imperfect development of the organ. It may also occur from interstitial gestation, when the ovum is lodged in the uterine parietes. All cases of rupture of the Fallopian tube, or of the cyst containing the fœtus, in extra-uterine gestation, may be compared, to some extent, to rupture of the uterus during normal gestation or parturition. Rupture sometimes occurs during the process of abortion, and I have known it to happen in a case of hydatid degeneration of the ovum.

The symptoms which sometimes warn us of impending laceration, are incessant and tetanic contractions of the uterus, under circumstances where the organ cannot be relieved by the descent of the head or presenting part. Whenever obstruction and violent uterine efforts concur, we must be on our guard against this form of danger. Cramp-like pain in the uterus, especially opposite the promontory of the sacrum, or the symphysis pubis, or distressing cramps in the lower extremities, occasionally precede rupture. A constant pain in some region of the uterus during the progress of labour, or in the latter part of pregnancy, is indicative of danger. This kind of pain during gestation, may be symptomatic of partial metritis, and of a similar affection during labour, or of severe local pressure. In the majority of cases, however, there are no premonitory signs of the accident which can be depended upon. We must rely for warnings, not so much upon symptoms, as upon a knowledge of the causes which lead to this accident.

The symptoms which denote the actual occurrence of rupture of the uterus, are generally very marked, though cases sometimes occur in which the evidences of the accident are so uncertain that it cannot be positively known until after death. There is usually a sudden, sharp, and excruciating pain, sometimes accompanied by a snap, audible to the patient, and even to the bystanders. With this there is recession of the head or presenting part of the child, and a sudden arrest of the pains. If the laceration be extensive, the child commonly passes through it into the abdominal cavity, and can be felt distinctly through the abdominal walls. A coil of intestine sometimes passes through the fissure, and is felt in the vagina. There quickly ensue upon the rupture, the symptoms of collapse, and the matter ejected from the stomach is of coffee-ground colour, consisting of epithelium and blood exuded from the gastric lining membrane, or bile which has been acted on by the acids of the stomach. There is a sudden gush of blood from the vagina, and blood escapes in considerable quantity into the peritoneal cavity. Another sign of very great significance, pointed out by Dr. M'Clintock, is the sudden death of the fœtus. The action of the fœtal heart often ceases suddenly, almost immediately after the accident; so that, in suspicious cases, the stethoscope should always be used. There are various circumstances, it must be mentioned, which complicate the diagnosis. In some cases, there is no immediate pain of a violent character, but the dangerous symptoms come on some hours, or even days, after the accident. Occasionally, and particularly when the lacerations are sub-peritoneal only, the pains do not cease. Sometimes, when the rent is considerable, the pains are not arrested, and the fœtus does not pass into the perinæum; cases also occur in which the rupture only takes place as the fœtus is passing through the external parts. Sometimes the recession of the head is caused by a sudden discharge of liquor amnii, or the head of the first child may suddenly recede in twin cases. As already mentioned, the great majority of cases end fatally. Patients may die of shock, or hæmorrhage, a few minutes after the accident, or they may die after days, or even weeks of suffering. When the result is protracted, death generally ensues from peritonitis, or from pelvic or uterine abscess. In some cases, the loop of intestine protruding through the vagina has been strangulated by the contracting uterus, and sloughing of the intestine, or the symptoms of strangulated hernia ensue. In rare cases, particularly when the rupture has depended on external injury, women have recovered, and have borne children subsequently; and one or two instances are on record, in which women have lived with the fœtus in the abdomen, as occasionally occurs in the abdominal variety of extra-uterine gestation.

The most important part of the Treatment is that which may be termed the Preventive. This consists in the subdual, as far as possible, of local metritis during gestation or parturition; the induction of premature labour in cases of pelvic deformity; the moderation of excessive uterine inaction: the promotion of the dilatation of the os uteri without violence; and the relief of the patient by craniotomy when the pains cannot be moderated, and when the proportions between the head and the pelvis are such as to render the delivery of a living child impossible. As regards the means of diminishing excessive uterine action and rigidity of the os uteri, the effects of venesection, tartar emetic, and chloroform, have already been remarked upon.

The Treatment of rupture, when it has positively occurred, demands every attention, both on account of the child, and because occasionally women recover, under such circumstances, from the utmost extremity of danger. The greatest chance of safety is given to the woman by immediate delivery. If the child has passed entirely or partially into the abdomen, the hand should be introduced, and the feet drawn down, and delivery effected as promptly as possible, care being taken not to injure any of the abdominal viscera, or to draw them down through the opening. When the disproportion of size is such as to render the extraction of the head difficult, it should be perforated behind the ear, particularly if the child be already dead. When the head has not receded after rupture, and when the pelvis is full-sized, the forceps may be used: but cases admitting of their application in this contingency are seldom met with. The general rule is to deliver, under such circumstances, by the perforator and crotchet. This operation requires, however, greater care than usual, on account of the tendency of the head to recede under the use of the instrument. When the child can be delivered promptly by any of these means, the amount of shock and subsequent peritonitis is to some extent moderated. Cases, however, occur in which delivery *per vias naturales* is difficult or impossible, either from rigidity of the os uteri, or from contraction of the uterus, and especially of the aperture through which the child has escaped into the abdomen. Under such circumstances, if the woman is in a state to admit of it, and especially if the suffering be great, it is probable that chloroform may be of great use by relaxing the uterus, and thus averting the alternatives of abandoning all attempts at relief, or of performing gastrotomy. Incisions into the os uteri have been recommended with a similar intention. In this desperate condition, when the difficulty depends on contraction of the mouth of the womb, some have said the best practice is to leave the case entirely to Nature, pointing to the extraordinarily rare cases in which the child has been discharged by abscess through the abdominal walls, and the mother has recovered. Others advise the performance of gastrotomy, and the removal of the child, especially if the fœtus be alive. This is, of course, a desperate remedy. It is very questionable which of these two modes of procedure is to be preferred. In cases of great collapse, and when death is imminent, the performance of gastrotomy is not to be commended; but when the patient is strong, and delivery by other means is found to be utterly impossible, without even greater dangers than this operation holds out, I think it should be performed. We must, however, be sure of our diagnosis before venturing on so grave a step, particularly as not long since, gastrotomy was performed with this intention in the metropolis, in a case, when, on opening the abdomen, no rupture of the uterus was found!

Immediately after the extraction of the child, full doses of opium are required. During the state of collapse, stimuli should be administered, bearing in mind, however, the peritonitis which ensues if the patient survives. With respect to the general plan of treatment, it may be said that it should be very nearly the same as that to be recommended hereafter in cases of extra-uterine gestation after the rupture of the cyst. Particular points of difference in individual cases will have to be met as they arise.

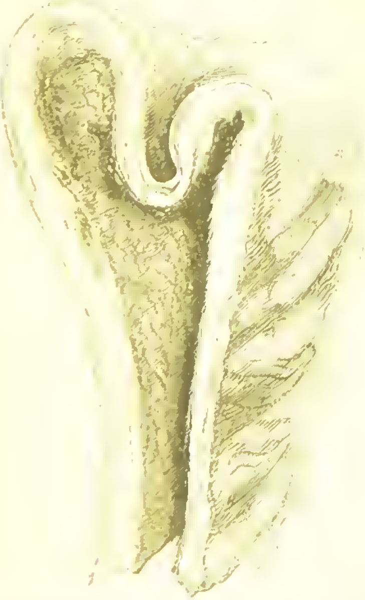
CHAPTER XXXVIII.

INVERSION OF THE UTERUS, ETC.

This accident has sometimes been attributed to irregular action of the uterus, but more generally to mechanical traction of the cord, and to injudicious attempts at removing the retained or adherent placenta. When inversion is referred to traction of the umbilical cord, whether in consequence of a short funis, the sudden birth of the fœtus while the mother is in the upright position, or the attempts of the obstetrician to remove the placenta, it is always believed to depend on the merely mechanical force which is in operation. It is considered that the fundus uteri is dragged down mechanically through the os uteri and vagina, the uterus being supposed to be passive during the occurrence of the inversion. I have always been of opinion that, in the great majority of cases, the accident happens in consequence of irregular but active contractions of the uterus itself. No doubt, cases may occur in which inversion is produced by great tension upon the cord, while the placenta is firmly adherent to the fundus, and that all violent traction of the cord while the placenta is attached to the fundus is reprehensible. But when inversion is thus produced, there must be a consenting action of the uterus. The accident has sometimes happened when the hand has been introduced to peel off the placenta from the fundus, when the hand, placenta, and uterus have all been forced out by the violence of the abnormal uterine action. All the facts connected with this catastrophe show that it generally depends, not upon a passive, but an active, condition of the organ. There are numerous points which prove that it may happen spontaneously, and apart from all interference on the part of the accoucheur. It may occur after the death of the mother, as the result of post-mortem contraction of the uterus. Numerous cases are on record in which the uterus was found inverted before any attempt whatever had been made to remove the placenta, and while the patient was lying quietly in bed. It is sometimes caused, several hours after the completion of labour and the delivery of the placenta, by violent after-pains. It has even been known to occur in the unimpregnated uterus. I have elsewhere insisted that the unimpregnated and virgin uterus, particularly under irritation, possesses more motor power than is generally attributed to it. The nulliparous organ has been known to invert itself, as the result of spasmodic action, in long-continued menorrhagia, or as the result of a small polypus or fibrous tumour in the cavity of the uterus, or upon its peritoneal surface. The more the subject of uterine inversion is studied, the less will the accident be referred to merely mechanical derangements.

Let us observe the steps by which complete inversion is produced. There is, first, cup-like depression of the fundus uteri; coincident with, or immediately following upon, this depression, there is hour-glass contraction of the body or lower portion of the uterus. (Fig. 156.) The annular contraction of the body of the uterus grasps the introcedent fundus as it would a foreign body, and carries it downward for expulsion

FIG. 156.



Commencing inversion of the uterus, from a preparation in the Museum of Guy's Hospital.

through the os uteri, the os itself being at this time either in a state of inertia, or actively dilated, just as at the end of the second stage of labour. After the inverted uterus has passed through the dilated os uteri, this part of the organ becomes contracted, preventing re-inversion from taking place. Thus there is, first, depression of the fundus uteri, with annular or hour-glass contraction of the body of the uterus, and dilatation of the os uteri. Next, there is intus-susception of the fundus by the body of the uterus. Lastly, complete inversion occurs, with contraction of the os uteri upon the inverted organ. If we wished to describe this accident in three words, they would be,—introcession—intus-susception—inversion. The displacement may not always be complete; it may in some cases stop at introcession; in others, at intus-susception, and then return to the natural state; or it may remain intus-suscepted, or in a state of partial inversion. We may compare perfect inversion of the uterus to intus-susception of the intestinal canal, only that the intus-suscepted portion of intestine is not protruded externally.

Inversion produces violent disturbance of the nervous system, and is commonly attended by alarming hæmorrhage. But the symptoms of the intus-suscepted uterus are equally violent, and in some cases still more so. The strangulation of the fundus is almost as severe a shock to the system as actual rupture. In complete inversion, the hæmorrhage is somewhat arrested by the os uteri acting as a tourniquet to the uterus. In either case the shock to the system may be so great as to cause death within a short time after the accident. The shock is so severe that a fatal result has ensued where little blood was lost, and where, after a short time, the re-inversion of the uterus was effected. The diagnosis of this affection is sufficiently easy when the placenta is adherent to the inverted uterus, but there are circumstances which complicate the diagnosis, when a tumour appears in the vagina after the separation and expulsion of the placenta. In true inversion, the globular ball of the uterus is entirely absent from the hypogastrium, and a bleeding mass is found in the vagina, or protruding externally. This mass may, however, be simulated to some extent by a prolapsus or procidentia, occurring immediately after labour, or by the extrusion of a polypoid tumour after the expulsion of the placenta. In the case of the prolapsed or procident uterus, the diagnosis is easy, from the presence of the os uteri in the most depending part of the tumour. The distinction between polypus and inversion is not so easy, particularly when the polypus is of a fibrous character, and of the same density and structure as the walls of the uterus itself. In the case of polypus, there is the sensation of a solid mass, and in inversion, that of a hollow organ is conveyed to the finger. When punctured or pricked, the uterus is said to be much more sensitive to pain than the polypoid tumour. In complete inversion the fossa round the base of the tumour is limited in extent, while in polypus the finger may be passed into the cavity of the organ, the pedicle can generally be felt, and there is the hard uterine tumour in the lower part of the abdomen. Great care is required in the diagnosis, as numerous cases have occurred in which a polypus has been mistaken for an inverted uterus, and in some instances, inversion has occurred without the accident having been recognised at all, until long after the time of labour.

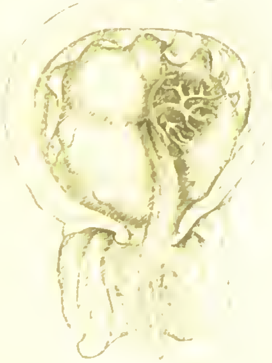
Inversion generally occurs quickly after the delivery of the fœtus, between the expulsion of the child and the expulsion of the placenta. I have known it to take place after the death of the mother, and after rupture of the uterus had occurred. In the latter case, the fœtus was passed into the peritoneal cavity, while the uterus became inverted, and protruded through the vagina. The predisposing causes of the accident are the causes of acute labour, and excessive or irregular action of the uterus. It is of very great importance to understand clearly the real nature of inversion, as it is one of those accidents which is most confidently referred to malpractice by the friends of patients. The less it is considered a mechanical displacement, the less disposition will there be to attribute its occurrence to the accoucheur. Owing to the prevalence of the mechanical idea respecting its origin, obstetricians have often been blamed most unjustly in cases of post-partum inversion.

The treatment consists in the speedy mechanical re-position of the uterus. Immediate steps should be taken to reduce the inversion, because of the rapidly increasing contraction of the os uteri, which, by impeding the circulation, causes an increase in the size of the tumour. The size of the uterus should be reduced as far as possible by pressure, and by detaching the placenta in cases where it still adheres. By moderate but sustained force the uterus is then to be passed up through the vagina and os uteri. After the organ has been partly passed through the os uteri, the muscular action of the uterus itself assists in restoring it to the proper position. It is reinstated with a sudden jerk, causing a considerable report at the moment of its restoration. In cases where intus-susception exists, the hand must be passed through the os uteri, so as to overcome the annular contraction, and to restore the intus-suscepted portion to its proper position. In all cases of sinking, with pain, the vagina should be examined with a view to ascertain whether partial inversion exists, as it is probable that it sometimes occurs and causes a fatal issue without having been detected. Cases of intus-susception and inversion require careful watching until the uterus has permanently contracted. Although it may justly be said that inversion may occur when the accoucheur is entirely blameless, I do not think the same can be said when the case is allowed to remain unreduced, and the patient lives on in a state of extreme misery and danger. It would be extremely culpable if such an accident as complete inversion either passed unrecognised, or if the first few hours after labour were allowed to pass without the re-inversion of the uterus. I cannot suppose that with proper and prompt management any case could be considered irreducible, within a reasonable time after the accident. Supposing the os uteri to be in a state of spasmodic contraction, we have in chloroform a powerful means of rendering it dilatable, and of allaying pain when the tender state of the uterus is such as to prevent the necessary manipulations. In these cases promptitude in action is of the greatest consequence. Every hour that elapses after the accident, before the reduction of the inversion is effected, increases the difficulties in the way of its accomplishment. Very rare cases are met with, in which menstruation has been normally performed with an inverted uterus, and when the presence of a tumour in the vagina and a constant leucorrhœal discharge have been the only symptoms: and cases are recorded in which the uterus has spontaneously re-inverted itself a considerable time after delivery. Usually, however, the patient is subject to an almost constant drain of blood and muco-purulent discharge from the inverted mucous surface, and she perishes miserably and after a longer or shorter interval. The alternative, when reposition is considered impossible, is, the extirpation of the inverted organ by the dangerous operations of the ligature or excision.

There are some other abnormal actions of the uterus, allied in some respects to Inversion, to which attention may now be directed.

Encysted Placenta is a term sometimes applied to cases in which a sphincteric contraction of the os uteri comes on rapidly after parturition, before the placenta has been expelled. The placenta, in these cases, may be either attached to the uterus, or it may have been thrown off, and be lying close within the contracted os uteri. This complication is most common after acute labours, or in prolonged labours, where the pains have been excessive, up to the time of delivery. Excepting that it occurs after delivery, instead of in the early stage of parturition, it is comparable to that form of rigidity, in which sphincteric contraction of the os uteri is predominant. Owing to the increased mobility which the os uteri acquires during the progress of labour, its post-partum contractions are sometimes more forcible than any active contraction which occurs before delivery; and the rigidity in this case is never mechanical, but always muscular, because of the great dilatation which has occurred during the progress of the labour. Sometimes the os uteri is contracted while the fundus is in a state of inertia, but in other cases of retained placenta there is not only contraction of the os uteri, but of the entire organ. (Fig. 157.)

FIG. 157.



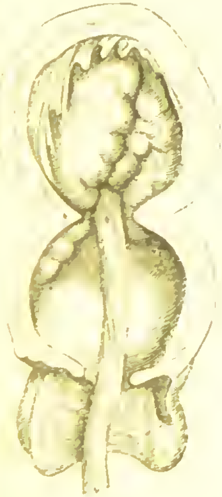
Contraction of the os uteri and the whole of the uterine cavity.

In treatment, it is of considerable importance to deal promptly with these cases. The longer the os uteri remains contracted, the more difficult will its dilatation, so as to admit of the extraction of the placenta, become. If the placenta can be felt close to the os uteri, gentle but firm traction of the cord, held as near as possible to its root in the placenta, should be used, so as to convert the placental mass into a dilator. We can often beneficially assist the effects of traction of the umbilical cord in dilating the os uteri, by gentle pressure exerted externally upon the abdominal surface, at each recurrence of the uterine contractions, sweeping the placenta, as it were, into the pelvis and towards the os uteri, by the ulnar edge of the hand, while steady traction of the cord is being kept up. If these methods should not be successful, the os uteri must be slowly dilated by the fingers, so as to admit the hand or fingers, according as the placenta may be required to be detached from the uterus, or merely withdrawn from the cavity. The utmost gentleness consistent with the necessary force should be employed; and if necessary, any threatening of convulsion or laceration should be prepared for by bloodletting. If the patient's mind should be excitable, or the dilatation of the os uteri should be painful, an opiate is of great use; but it acts rather by soothing mental emotion and allaying pain, than by reducing the spasm of the os uteri. When the case is misunderstood or neglected, death may ensue at a longer or shorter interval from putrefaction of the placenta and the absorption of poisonous matter into the system. I have met with several cases of encysted placenta, where the secundines had been allowed to remain a considerable time, and where the os uteri was in a state of the most perfect contraction, in which chloroform was of the greatest possible use in relaxing the os uteri, and allowing the accoucheur to perform the manipulations necessary for the removal of the placental mass.

The foregoing remarks apply to cases in which the placenta is either wholly adherent to the uterus, or the whole uterus so firmly contracted upon the separated placenta as to prevent internal uterine hæmorrhage. Cases, however, occur, in which spasmodic closure of the os uteri is attended with separation of the retained placenta, and inertia of the body and fundus. In such cases, dangerous internal hæmorrhage is inevitable, and the removal of the contraction of the os uteri becomes quite secondary in importance to the arrest of the hæmorrhage. Our first object here must be to excite such an amount of uterine contraction as to stay the loss of blood. In all cases where the first steps taken for the dilatation of the os uteri, which of themselves tend to produce uterine contraction, are ineffectual, the uterine inertia should be treated most energetically, without reference to the state of the os uteri.

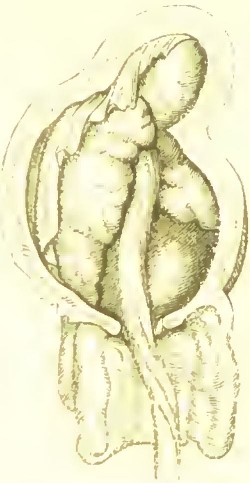
In some cases of retained placenta the uterine spasm is not situated at the os uteri, but at the junction of the cervix uteri with the body of the organ; in the same situation, in fact, as the narrow portion of the organ in the unimpregnated state, and at which the greatest resistance is met with in the introduction of the uterine sound. This state of the uterus is called Hour-Glass Contraction. (Fig. 158.) In other cases the constriction is still higher up, involving a portion of the body of the uterus or the fundus, being similar in its nature to those band-like spasmodic contractions, which are sometimes observed in the large intestine. (Fig. 159.) In the lower animals, where the uterus in its anatomy resembles an intestine, there can be no difficulty in understanding this form of annular contraction.

FIG. 158.



Hour-glass contraction.

FIG. 159.



Contraction of upper portion of uterus.

In other cases, the hour-glass contraction occurs after the separation of the placenta, when it may be the cause of internal hæmorrhage, because of the inertia of that portion of the uterus which is above the stricture. After the expulsion of the fœtus, the contractions of the uterus ought to be uniform in the entire organ, so that in hour-glass contraction there is always a double departure from the physiological condition of the uterus; there is both spasm and inertia. The treatment of these cases must be conducted on the same principles as cases of sphincteric contraction of the os uteri; but we have an additional remedy, of considerable efficiency, in frictions applied to the abdomen over the uterus. True and complete hour-glass contraction is a rare affection; but in very many cases of post-mortem hæmorrhage, portions of the uterus are spasmodically contracted, while others are so relaxed as to admit of the flow of blood from the mouths of the vessels on its internal surface. Occasionally it happens that one lateral half of the uterus will be contracted while the other half is relaxed. In cases of hæmorrhage, with hour-glass contraction, there may be no escape of blood *per vaginam*, the effused fluid being confined in the upper chamber of the uterus by the stricture.

The causes of hour-glass contraction may be any of the causes of acute, irregular, or tardy labour; but it most generally occurs after rapid parturition, particularly the rapid transit of the child through the external parts. Coagula in the uterus, the retained placenta, or improper traction of the cord, and mental emotion, are all exciting causes of the accident.

It will be useful to compare the different forms of irregular action of the uterus with each other. The resemblance between the spasmodic form of Rigidity of the os uteri during labour and the most simple form of Encysted Placenta—namely, sphincteric closure of the os uteri with retention of the placenta—is at once obvious. The same contracted state of the os uteri is present in Inversion, after the uterus has descended through the os uteri. In the form of encysted placenta, or irregular action of the uterus, constituting Hour-Glass Contraction, we have precisely the same condition of the middle portion of the uterus as that which obtains in the second stage of inversio uteri. In simple hour-glass contraction, the cavity of the uterus is divided into two parts by the contraction of the middle portion of the organ; but when, owing to irregular action of the fundus, this part of the organ descends into the cavity of the uterus, and the hour-glass contraction then occurs, the fundus uteri is seized by the contracting ring of the uterus, borne down through the os uteri and vagina, and inversion is thus rendered complete. After the inversion, the os uteri, which dilates to allow the inverted uterus to pass, becomes firmly contracted. Again: all these abnormal actions, occurring after delivery, are but modifications of excessive After-Pains. In severe after-pains, it is easy to feel with the hand that the uterus becomes hard and prominent at particular points, and soft and depressed at others. From these irregular contractions the more serious irregularities of uterine action arise. Sphincteric and premature closure of the os uteri is the most simple derangement; next comes the annular contraction of the upper part of the cervix, or the body of the uterus, in hour-glass contraction; and lastly, the phenomena of inversion, which is the most compound of all these disordered actions. Thus rigidity of the os uteri, encysted placenta, inversion of the uterus, hour-glass contractions, and excessive after-pains, are merely modifications of irregular uterine action, and they are all convertible one into the other. These views materially simplify our comprehension of these post-partum accidents. It may be truly said, however, that hitherto they have generally been treated of in an isolated manner, and with little reference to uterine physiology, or to their evident relationship with each other.

CHAPTER XXXIX.

PUERPERAL MANIA.

The specific forms of mania incidental to child-bearing may occur either during pregnancy, at the time of labour, in the puerperal period, or in the course of lactation. Of these mental forms of disorder, Puerperal Mania is the most frequent and formidable.

In Pregnancy, we sometimes have the nervous symptoms met with in gestation, existing in such an aggravated form, that the balance of the patient's mind is lost, and her reason and moral faculties totter and fall for a time. This state of things is brought about by the hysterical temperament, when in a state of intense development; by improper moral management on the part of friends and relations, by neglect or disorder of the excretory functions; by hereditary predisposition to insanity, and by sudden shocks, &c. Its treatment has already been referred to, when speaking of the diseases of pregnancy, and, in the last resort, the only remedy we can depend upon is the induction of premature labour.

In the course of Labour, a nervous, excitable subject may, at any time, suffer a transient loss of reason during the height of a powerful pain attended by almost unbearable anguish. This happens most frequently, however, and for a longer time, at the moment when the head passes through the os uteri, or the os externum, and particularly the latter. I have known it also to occur at the moment of birth, in cases where the forceps have been used. It is more apt to take place in first labours than in multiparous women, and when the head of the child is of larger size than usual. Women sometimes lose their self-consciousness, or self-control entirely, and commit, if allowed, most extravagant acts, in these brief intervals of insanity. When the attack occurs at the time of the passage of the head through the external parts, patients will attempt to injure the attendants or the infant; and there can be no doubt that, in some cases of infanticide, where the child is destroyed immediately after labour, the crime is committed while the mother is in a state of temporary and irresponsibl frenzy. Such cases should, however, only be received wit great caution. This form of mania is so transient that i generally only requires the necessary amount of restraint, an the removal of means of mischief, for a very short period. I have no doubt whatever, that such attacks of insanity migh always be prevented by the use of chloroform during th pains of labour, before the suffering had reached such a heigh as to make the patient frantic.

Genuine Puerperal Mania, or that which occurs shortl after parturition, appears to depend, in the great majorit of cases, upon the shock of labour; the general and loca irritation incident to delivery, and its immediate consequences and upon exhaustion and the depravation of the blood pr duced by gestation and parturition. Except in the fe cases in which inflammation of the brain occurs, when it removed from ordinary insanity, the disease is, I believ always attended by, and dependent in great measure upon, co stitutional exhaustion.

Various circumstances predispose to the occurrence of i sanity in puerperal women. It sometimes occurs in combination with uterine inflammation, or suppression of the lochia, the metritic irritation exciting the cerebrum in a reflex form. Occasionally, mania alternates with inflammatory disorder of the uterine organs or the peritoneum, the one disease completely receding as the other becomes prominent. The existence of puerperal mania will sometimes completely mask inflammation of the pelvic organs, and even phthisis. In other cases, intestinal irritation, or the use of improper and unwholesome food, is the exciting cause of the disease, as proved by its sudden disappearance when the stomach and bowels have been efficiently relieved. Cases are met with, in which the retention of viscid and morbid secretions in the breasts has by a reflex action excited the brain to the pitch of mania. This disease is often met with in women in whom hysteria has been very pronounced during pregnancy. Hereditary predisposition to insanity, morbid fear of labour and its results during pregnancy, frights in the course of pregnancy or labour, or in the puerperal period, are important predisposing elements. The hereditary tendencies of puerperal insanity have been made out by Gooch, Burrows, Esquirol, and others. In the present day no one has devoted himself to the elucidation of this part of the subject so much as Dr. Forbes Winslow. Women belonging to families in which insanity manifests itself are liable to puerperal attacks. Several women in the same family, or two or three generations, have been known to suffer from puerperal mania, and the same woman is sometimes attacked in successive pregnancies. It is found that in times of great public excitement or calamity, or the revolutions of states, puerperal mania is rendered more common. I saw a case during the late war, in which puerperal mania was caused by the intelligence of the sudden death of a near relative. It is believed to be more common in single women whose minds are distressed by pregnancy, and the dread of loss of character, than among married women. It has a tendency to occur in women who have children very rapidly, and who nurse one child during pregnancy with another; or in women who have twins or triplets, as sometimes happens, several times in succession. I had, some time ago, a maniacal case in St. Mary's Hospital, in which the patient had had twins three times out of seven deliveries, and on each occasion had suffered from mania. I have seen cases where it had apparently depended on the use of large quantities of chloroform during labour. It has been caused by profuse hæmorrhage, occurring during delivery or after labour; or as th result of profuse bleedings in puerperal convulsions or post partum inflammations. It also sometimes appears as the sequelæ of convulsions, in albuminuria, and the other form of convulsive disorder met with during labour. In son cases, sleeplessness, prolonged through several days an nights, appears to be a powerful exciting cause of the diseas but the insomnia is both a cause and a symptom of the disorder, and it is difficult to say to which category the pervig lium frequently preceding insanity should be most distinctl assigned.

Puerperal mania must be distinguished, not only fro phrenitis, but from pure delirium occurring during the fev incident in some cases to the first secretion of milk, or m with in the course of phlebitis or puerperal fever. Th pathological lesions found after death from puerperal man do not throw any great light upon the essential nature of t disease. No constant morbid changes are found within th head, and most frequently the only condition found in th brain is that of unusual paleness and exsanguinity. Ma pathologists have also remarked upon the extremely emp condition of the bloodvessels, particularly the veins.

The attack generally comes on within a week or ten da after delivery; less frequently it comes on at the completi of labour, and continues without intermission. Sometimes is sudden, the patient at once starting off from a state coherence into the realm of mania; but more frequently the are some days of premonitory warning. In the latter cas the patients are either unnaturally loquacious or tacitu talking incessantly, and upon the most trivial and irreleva subjects; or refusing to speak even when spoken to. Th is a tendency to complain of the husband, the nurse, or express dislike of the child, and a wish to injure it, wi other signs of moral perversion. The pulse is genera accelerated: the face pale, or occasionally flushed: the ey are preternaturally bright; there is intolerance of light, noi or of movement in the room. There is either unbroken slee lessness, or, if the patient sleeps, she is troubled with dream which render sleep unrefreshing. The bowels are often co tined. When this state of things passes on to actual man there is usually the same uncontrollable and incoherent quacity. If an attempt be made to take down the wor uttered by a patient suffering from puerperal mania, they yield, in the worst cases, not the slightest thread of coherent thought. The words or subjects of rambling talk are suggested by the objects coming before the senses, but the mind does not dwell more than an instant upon the same subject, or the words uttered by the patient herself, start successively the subjects of raving; but the prevenient words and heir suggestions are as irregular and uncertain as the hanging figures of a kaleidoscope, and at times the raving s an unmeaning jabber of fragments of words, or of sounds which hardly represent syllables. Sometimes, amidst an mount of incongruous raving, certain ideas are constantly ecurred to, such as the birth of the child, or the belief that he child is still unborn. Very frequently the language of uch patients is most obscene, and constantly turns upon exual matters, the movements of the body and actions being uch as to indicate a highly nymphomaniacal condition. elicate ladies will use language which it would be thought mpossible they could ever have had the opportunity of hearng. Sometimes events long forgotten, and even languages arned in childhood, will be remembered, of which the atient will have no knowledge subsequently. There is almost ways the inclination to commit violence upon herself or thers, and particularly upon the infant. Many patients are t times conscious of the suicidal or homicidal tendency, d implore those around them to defend them against their vil inclinations. When the disease becomes chronic, the ndency is generally to melancholic, rather than to other rms of derangement.

Sometimes patients refuse food altogether, or accuse those out them of administering poison, or they declare they e being starved even while they are eating ravenously. hese symptoms, or groups of them, in various modes of mbination, may exist for a few days, or they may continue r weeks or even months, the patient being reduced, in the otracted cases, to the utmost degree of weakness and deity. Nothing can exceed the marasmus of some of the ses of puerperal mania which spread over a long time. e state of the nervous system interferes in the gravest nner with the functions of nutrition, and the patient is rn out by incessant talking, locomotion, or such movement is permitted, and want of sleep. In the early stages of erperal insanity, the pulse is very quick, the skin dry and hot,

the head and neck throbbing and heated, and the tongue dry
the milk and lochia are commonly suppressed. As the diseas
becomes chronic, the tongue becomes comparatively clean an
the pulse not much above the natural standard. There is
peculiar sour smell about the breath, and the odour of th
skin is very disagreeable. The bowels continue constipate
When the urine has been examined, it has been found loaded wit
phosphates, from the rapid disintegration or metamorphos
of the material of the brain.

The indications of Treatment in puerperal mania are th
subdual of cerebral excitement, the removal of sources of r
flex irritation, the repair of exhaustion, and the manageme
of local disorders complicating the maniacal attack. The r
moval of the hair, the application of ice or cooling lotions
the head, blistering behind the ears, or upon the back of t
neck or the scalp, and, in rare cases, a few leeches to t
temples, are all that we should dare to venture upon in t
way of local applications in any ordinary case. Subsidiary
these means, but scarcely of less importance in calmi
nervous excitement, are the avoidance of light, of noise,
conversation, and the sight of persons and things having
irritating effect upon the patient. Every stimulus of t
senses and of the emotions should be suspended as far
possible. Local irritation should be removed, by drawing t
breasts when these are loaded, and by the exhibition of p
gatives. Cases are sometimes met with where the irritati
of the brain has depended on fæcal accumulations, whe
smart purge has at once and completely recovered the patie
But the cases requiring active purgatives need a nice disc
mination, otherwise injury is done by weakening the patie
and I have even seen cases which have arisen from exc
sive purgation. General bloodletting is never called for, it
hardly too much to say, in ordinary puerperal mania. Th
are few conditions of the economy in which bleeding is so
borne, and in which such disastrous results ensue upon
performance. Many cases are on record in which venes
tion has destroyed the patient with great rapidity. Withi
comparatively short space of time, I saw two maniacal ca
after delivery in the same district, one of which exempli
the danger of bleeding, and the other the origin of the disc
from exhaustion. In the first, symptoms of mania came
a few days after delivery, and while her medical attend
was shut up as a witness in a court of law, another pra

tioner was called in, who, seeing the patient in a state of raving excitement, with violent throbbing carotids, bled her profusely, after which she sank rapidly, and died in spite of all attempts to rally her. In the other case, the patient, partly from principle and partly from poverty, had been a teetotaller and vegetarian, and had had children at the rate of about one a year, suckling them upon water and a scanty innutritious diet. When I saw her, a week after delivery, her mind was wandering; she had scarcely, if at all, fallen asleep, even for a moment, during the time mentioned, and she had been harassed by the constant application of the child to breasts which refused to secrete their nourishment. The anæmia in this case was extreme. Her maniacal disorder increased, and she died, no support or stimulus making any impression upon her exhausted system.

Due attention being paid to the cerebral excitement, the patient should have a full amount of support and stimulus. It often happens that digestion and absorption are remarkably rapid in these cases, and the patient suffers from an exacerbation whenever the stomach is empty, or when she is kept long without food and stimulus. In may cases, wine, porter, or brandy, can be given freely, at stated intervals, with the best effect. Ether, ammonia, hyoscyamus, and camphor, are very useful as supporting and soothing the nervous system, particularly hyoscyamus in combination with ether or ammonia. Opium is exceedingly useful, especially in cases attended by protracted insomnia. In cases most strongly marked by excitement, chloroform has been inhaled with the best effects. When the disease becomes chronic, the preparations of iron, especially the phosphate of iron, quinine, and other tonics, are necessary. In long-continued cases there is special evidence of the exhaustion of the reproductive system. Amenorrhœa commonly exists until the mental disorder gives way. Generally, the mammary secretion is arrested from an early period; but beyond relieving the breasts when they are full, no attempt at suckling should be made in these cases.

Are there any essential differences between the puerperal and other forms of mania? Some authorities of eminence have believed that no such differences exist, while others have considered the varieties of insanity connected with the reproductive functions, and particularly the puerperal disorder, so peculiar as to constitute a distinct class. The answer to the preceding question will very much depend upon whether we take a large or a circumscribed view of such cases. If we look at the patient during the attack alone, the symptoms, it is true, vary little, if at all, from some other cases of insanity. If, however, we consider the previous and subsequent histories of cases of this kind, we shall come to the conclusion that there are special features arising out of the facts that the functions whose disordered conditions produce the insanity are not permanent, but temporary; that patients the subjects of puerperal attacks are not so liable as others to renewed invasions of derangement, particularly after the child-bearing epoch has passed, and that they are not so likely to transmit an hereditary taint to their offspring.

These points bear practically upon the management of puerperal cases. Those who suppose the puerperal and other forms of insanity to be identical, naturally advocate a similarity of treatment as regards restraint and seclusion. I believe, however, that great mischief is frequently done by placing puerperal patients in public and private lunatic asylums. In my opinion, such cases should rarely, if ever, b placed in asylums. After their recovery, they frequentl retain a life-long sense of the stigma of being so treated, th suspicion of hereditary mania is raised against families, an no good is obtained which could not be derived from a privat seclusion of such patients from their immediate families an friends. In no cases do the blessings of the modern treatment of the insane stand out more prominently. I remember when a student, seeing a patient suffering from puerpera mania kept for months in a dark pen, with only straw to li upon, and a rug for a covering. No patients require mor careful watching lest they should do themselves or other mischief. Every means of injury should be removed or pr vented, as far as possible, and the patient should never be le for a moment alone, or especially with her infant. It is nece sary to gain, by firmness, a mastery over such patients. Th recover more quickly when not allowed to see their husband infants, or immediate relatives, and they are most easil managed by nurses whom they have not previously known but they often retain for years the keenest sense of any re or apparent unkindness done to them during the continuanc of their disorder. In some other and more happy case nothing is remembered of the birth of the child or the subs quent illness. These are, however, exceptions, and puerper patients should always be treated as though they were destin to a perfect recovery, and to remain without any necessary tendency to subsequent mental disease. Dr. Hood dwells with great humanity upon the unhappy position of some of the patients confined for life in Bethlehem as criminal lunatics, who have killed their children during attacks of puerperal mania. Some of these poor creatures have passed the child-bearing age, are perfectly clear in intellect, conscious of what they have done, and suffer intense misery therefrom, while they have their desolation enhanced by mixing constantly with confirmed lunatics. Surely philanthropy should find some remedy for such a state of things!

The cases of insanity which occur as the result of undue lactation are very similar to cases of puerperal insanity, only that their symptoms come on in a more gradual manner. When nursing women complain of loss of sight or hearing, and headache, either their nourishment and stimulus should be increased, or suckling should be at once discontinued. Where there is any predisposition to insanity, mothers should not, if possible, be allowed to suckle their children. Besides the mere drain of lactation, such women are affected by a form of Chlorosis similar to that met with in pregnancy. Women who are amenorrhœal during lactation positively often suffer more than those who menstruate regularly. In all cases of this kind, the dependence of the mania upon exhaustion is abundantly evident. It is especially likely to happen when pregnancy and lactation are allowed to proceed simultaneously.

There is in the subjects of this form of disease the same suicidal and homicidal tendencies as in puerperal insanity. I once met with a case in which a mother delivered of twins became affected in her mind from suckling, and a wet-nurse was procured in the person of a young girl who had given birth to an illegitimate child. She had nursed her own infant for some time, and then, while being drained by the twins, again became pregnant. Signs of insanity manifested themselves, and she was one day found dead, hanging behind the door of her room. This form of insanity sometimes comes on weeks or months after the close of lactation. I have no doubt that the woman Brough, who killed, some years since, several of her children at Esher, and who was afterwards confined in Bethlehem, had suffered from over-lactation. She had weaned a child not long before the dreadful tragedy; had complained of loss of sight and severe nervous disorder; and had suffered in her head in previous lactations. The preventive treatment of this form of insanity consists, of course, in weaning as soon as any marked signs of nervous disorder are perceived. In the management of such cases, great care in guarding the patient is necessary, and the treatment of this disease must be a supporting and stimulating one, combined with perfect rest, and the avoidance, as far as possible, of all moral and physical excitement.

CHAPTER XL.

PUERPERAL CONVULSIONS.

Convulsions, like the other disorders of parturition arising from excessive nervi-motor action, may be divided into those of Centric and those of Eccentric origin. This division is therefore the most convenient for the consideration of the Causes and Treatment of this formidable disease.

Any mechanical or emotional stimulus applied in excess to the spinal centre itself, may excite convulsion during the puerperal state. In all women the excitement of the nervous system inseparable from parturition, is a predisposing cause of the attack, which is provoked whenever any other sufficient exciting cause supervenes upon this parturient excitability. Puerperal convulsions are not, however, limited to the act of parturition, as they may occur during the latter part of pregnancy, and cease before the coming on of labour, or they may appear after delivery.

The Centric causes of convulsion may be either intra-cranial or intra-vertebral, or both. The true spinal marrow being partly in the vertebral canal and partly in the cranial cavity. I proceed to speak first of the intra-cranial causes.

A clot of blood, or serous effusion, occurring in any part of the brain, may cause convulsion by mechanical counter-pressure upon the medulla oblongata. In full states of the circulation, convulsion may be caused by cerebral distension alone. Here it must be the counter-pressure on the medulla oblongata which, in part at least, produces the disease. Any disease whatever of the brain, of the membranes, or of the skull, capable of exerting internal pressure, may cause convulsion in this manner.

The intra-vertebral causes of convulsion consist chiefly of disorders of the spinal meninges, and upon conditions affecting the substance of the spinal marrow itself. Probably excessive distension of this organ with blood excites convulsions; it is certain that the opposite condition, spinal anæmia, becomes a powerful exciting cause. In cases of irremediable uterine hæmorrhage, convulsion is the common form by which death occurs; or a convulsion may occur from loss of blood before the patient is *in extremis*. I shall, moreover, endeavour to show hereafter, that in some cases of convulsion arising from other causes, excessive bloodletting comes in at length as a cause of the fits, the therapeutics of the disease trenching distinctly upon its pathology. In animals killed by bloodletting, either by experiments or at the shambles, convulsion always occurs during the act of dying.

The state of the blood circulating in the whole of the spinal marrow, as regards its constitution, is an important cause of centric convulsion. All agencies which interfere with the proper depuration of this fluid during pregnancy, or on the approach of parturition, contribute to render the blood a morbid stimulant to the spinal system, as it circulates in the vessels of the spinal marrow and the spinal system of nerves. Such are the constipation and insufficient secretion from the bowels caused by the mechanical pressure of the gravid uterus upon the intestines. Cholæmia depending upon insufficient action of the liver, is sometimes present to a considerable extent. The state of the kidneys which exists with or causes albuminuria, accumulates urea and other noxious elements in the blood. This condition of uræmia requires a special notice, as being by far the most important and general of all the centric causes of puerperal convulsion; and I propose to consider it in a subsequent part of the present chapter. Great as its importance undoubtedly is, it is far from being the sole cause. We ought not to consider it to the exclusion of other causes of convulsions, as it has been too much the fashion to do in recent years. The encroachment of the abdomen upon the thorax must also render the due oxygenation of the blood difficult. Asphyxia invariably produces convulsions, and when it occurs during parturition, must necessarily produce this disease. The act of abortion from asphyxia seems to be almost a part of the general convulsion excited by the deprivation of oxygen, and the consequent loading of the blood by carbonic acid. There are various other sources of sanguineous impurity, all of which contribute their quota towards rendering the blood morbidly irritating to the nervous centres. It deserves to be borne in mind that the depuratory functions ought, in order to preserve health, to be increased during gestation, as the *débris* of the fœtal, as well as the maternal systems, have to be eliminated by the organs of the mother. Besides these forms of toxæmia, the state of the blood which obtains in fevers, or during the excitement of the first secretion of milk, or in poisoning, may excite convulsive disorder. In all these cases the affection of the nervous system is centric, and not reflex.

These are the chief *Physical* causes of disease; but there is another and very effective cause of puerperal convulsion which is *Psychical* in its character. I refer to the influence of Emotion.

Emotion, then, is a very important cause of centric convulsion in the puerperal state; important both on account of the severity of the attack when thus induced, the greater absence of premonitory signs, and the obstinacy of the disease as regards treatment. It is a very old and true observation, that convulsion is often met with in single women whose minds have been depressed by the sense of shame and misery inseparable from their condition during gestation. These subjects, it should be mentioned, are more prone than others to suffer from albuminuria, as they increase the pressure of the gravid uterus on the internal organs, by tight-lacing and other means of disguising their condition. But any violent emotion of the mind, whether of joy or sorrow, the agreeable or disagreeable, may also excite a convulsive attack. The return of a husband, the first sight of the infant after the hours of intense expectation, the pain and dread of parturition, or any intelligence whatever, suddenly communicated, may hurl the patient into convulsion. I myself saw a case in which a husband, returning from a distant and perilous journey a day or two after his wife's delivery, in the very act of greeting him she fell into convulsion; and instead of embracing a conscious mother, he held in his arms the rigid form of an epileptic. The fit is sometimes produced by emotional causes of a trivial character. Mauriceau related a very singular case, in which puerperal convulsion was excited by the disgust caused in the mind of a patient by the entrance into her apartment of a coxcombical friend, whose dress was powerfully scented.

Such being the principal *Centric* causes of puerperal convulsions, let us now consider the *Eccentric*, or those caused by irritation of incident, excitor nerves, acting through them upon the true spinal marrow, and its motor nerves.

First in importance is, Convulsion from Irritation of the Uterus itself and the Uterine Passages.

The statistics of labour demonstrate that puerperal convulsions occur with greater relative frequency when the head presents, than in other presentations. From this it has been inferred that its pressure on the os uteri was a principal cause; but the acute mind of Dr. Collins saw that this coincidence could not be considered as cause and effect, for convulsions frequently come on when the os uteri is entirely dilated; before the dilatation has commenced; or after delivery. Neither this eminent obstetrician nor any other has taken the pressure of the head on the vagina sufficiently into consideration, in connexion with the fact that irritation of the vagina excites more extensive reflex muscular actions than irritation of the uterus itself. This gives a physiological explanation to the fact respecting the frequency of convulsions in head-presentations with first children, the irritation of the excitor nerves of the os uteri and the vagina being undoubtedly greater under such circumstances than any other. I might adduce numbers of cases in support of this view; in fact, any case in which all remedies have been tried in vain, but in which the convulsions cease immediately after delivery, contains its proof. It must always be borne in mind, when considering the causes of excito-motor diseases, that irritation of the peripheral incident nerves is not dependent on, or to be measured by, the mere intensity of pain. It has been shown again and again that the most powerful reflex action of the *vis nervosa* may be caused without any sensation whatever; indeed, in puerperal convulsions the causes operate sometimes during a state of perfect coma, or they may commence while the patient is in a profound syncope. The term irritation, when applied to spinal action, must therefore be received with its peculiar signification.

Convulsions may be brought on by the mere presence of the fœtus *in utero*, there being no other exciting cause, or they may occur from the causes of spinal irritation depending on the first changes which take place in the uterine system preparatory to labour, before the os uteri has commenced its dilatation. They are sometimes caused by the irritation of a dead fœtus. The mere distension of the uterus by the liquor amnii, particularly in cases where there is a large quantity of this fluid, has appeared to give rise to convulsions.

When a convulsion has once happened, the fit may be repeated from causes of uterine irritation apparently trivial. Irritation of the os uteri is one of these. Denman relates the following of a case which occurred to him :—When the os internum began to dilate, I gently assisted during every pain ; but being soon convinced that this endeavour brought on, continued, or increased the convulsions, I desisted, and left the work to Nature." A similar case has been related by Dr. Heming. In other cases, fits have been produced by the hand of the accoucheur in the operation of turning, or by the irritation caused by the use of instruments. Irritation of the os externum is also a powerful excitor of spasmodic action. Some women die from the violence of the convulsion caused by the passage of the child through the external parts. It has even happened that successive fits have been caused by irritation of the uterus from injudicious attempts to apply an abdominal bandage, when the irritable condition of the patient has been such as not to be able to bear it.

The following are two interesting cases of puerperal convulsions from irritation or excitation of the excitor nerves of the uterus and uterine passages, the irritation being conveyed to the spinal marrow, and reflected back on the motor nerves of the whole spinal system, so as to cause the convulsions. The first is related by Dr. Ingleby :—

"A highly esteemed friend of mine once found it necessary to pass his hand into the uterus, for the purpose of removing an adherent placenta, the ergot of rye having been previousl administered. The introduction was carefully performed *The straining and opposition to his efforts on the part of th woman were exceedingly great ; and at the moment when th operator's hand had reached the organ, my own hand makin counter-pressure on the abdomen,* the patient became violentl convulsed, and died in less than a minute."

The second is from Dr. F. H. Ramsbotham, who relates case of convulsions in which the fits were relieved by bleeding, and the woman remained fifty hours after the attac before labour came on. In less than five hours she was delivered without any recurrence of the fits ; but as the placent did not come away, Dr. Ramsbotham was summoned, tw hours after the expulsion of the child. He remarks tha

"Under no greater anxiety than usual when the placenta is retained, I proceeded in the ordinary way to remove it. *The moment I had passed my hand completely into the uterine cavity*, the patient turned upon her abdomen, and without uttering any expression of pain, went into a convulsion."

Puerperal Convulsions may arise from Irritation of Intra-cranial Excitor Nerves. It may appear a nice distinction to classify convulsions arising from cerebral pressure on the medulla oblongata, and convulsions caused by irritation of the membranes, under different heads. Yet the one is Centric, the other Eccentric. Cerebral pressure affects the medulla oblongata directly, meningeal irritation reaches it reflexly, so that some distinction is really demanded. The known intra-cranial causes of puerperal convulsion of a reflex character are, bony projections and exostoses, inflammation of the meninges, the extension of red softening of the brain to the membranes, or the extension of irritation from a coagulum in the substance of the brain. Thus, in puerperal convulsion, we have to study the brain and its envelopes under many and very important points of view; 1, as the seat of some of the most important changes which occur during the fit; 2, as the seat of an important class of centric causes of convulsion; and 3, as the source of irritation acting upon the spinal centre in reflex forms. As a reflex cause of convulsion, we must study the brain as we would the uterus, the stomach, the intestines, &c.

Irritation of the Bowels, especially of the lower part of the intestinal canal, is well known to cause convulsions under other circumstances besides those connected with the puerperal state. Thus, worms, the severe action of purgative medicines, the collection of indurated fæces in the bowel, have all been known to cause epilepsy, and the convulsions of children. It cannot therefore be wondered at, that when the excito-motor system is under the additional stimulus of either pregnancy, labour, or the puerperal state, these and similar sources of excitation should cause puerperal convulsions. Gastric irritation has long been looked on as a cause of puerperal convulsions, though the true *rationale* has not been given by obstetric writers. Irritation of the Bladder is a less frequent, though undoubted, cause of puerperal convulsions. Other causes than those which have been given occasionally operate on the spinal system, but all act in accordance with the principles already advanced. Mr. Ingleby suspected that irritation of the Mammæ might cause convulsions. Not long since, I saw a case of puerperal convulsion for which no other cause could be assigned than excessive soreness of the nipple, with mammary induration. The Skin, too, as an important excito-motor organ, must be studied in relation to puerperal convulsions. The same may be said of the Liver, and other organs supplied by the pneumogastric nerve.

Such are the principal causes of puerperal convulsions, to the *modus agendi* of all of which the physiology of the true spinal marrow goes far towards supplying a perfect explanation; and it must be remembered that, wanting this mode of solution, the disease formed, confessedly, one of the enigmas of modern pathology. To give a summary of the whole subject, the true puerperal convulsion can only occur when the central organ of this system—the spinal marrow—has been acted on by an excited condition of an important class of its incident nerves—namely, those passing from the uterine organs to the spinal centre, such excitement depending on pregnancy, labour, or the puerperal state. While the spinal marrow remains under the influence of either of these stimuli, convulsions may arise from two series of causes: those acting primarily on the spinal marrow, or centric, causes; and, secondly, those affecting the extremities of its incident nerves, or causes of eccentric or peripheral origin. Though the subject admits of this division, several causes may act together, and centric and eccentric causes may be in operation at th same time. I have made no attempt at a division into predisposing and exciting, proximate and remote causes, becaus it is evident that a cause which in one case is the exciting o proximate, may in another be the predisposing or remot cause. Thus, irritation of the uterus may be the predisposing and irritation of the stomach the exciting, cause, in one instance; while in another, irritation of the uterus is both th predisposing and the exciting cause; hence any such divisio must be to a great extent, arbitrary, and devoid of precis meaning. The symptoms very closely resemble those of epilepsy, except that, instead of single fits, there is a successio of convulsions.

In the Treatment of puerperal convulsions, we have to consider remedies which act on the central organ, the spina marrow, and those which affect the extremities of inciden spinal nerves. I propose, in the first instance, to consider the remedies of direct or centric action. Of these, Bloodletting is the most important.

The action of bloodletting on the spinal marrow is greatly modified by the condition of the circulation. In fulness of the vascular system, it is a powerful sedative of spinal action. Hence, venesection is a great remedy in the simpler form of puerperal convulsion, where the disease chiefly depends on stimulation of the spinal marrow by excess of blood, or the mechanical pressure exerted by the blood on that organ, together with the counter-pressure of the distended brain, on the medulla oblongata. In such cases, bleeding should be performed with a view to its sedative action on the spinal marrow, and to avert the mechanical effects of vascular pressure from this organ. Alone, it will frequently be sufficient to subdue the disease, particularly when the fits come on before the beginning of labour or after delivery. But the second important intention of bloodletting should never be lost sight of, — namely, that of preserving the brain from injury during the convulsion. Besides the primary cerebral congestion, which may have been the cause of the attack by its counter-pressure on the medulla, the convulsive actions themselves exerting great muscular pressure on the whole vascular system, and causing, as they do, great turgidity of the vessels of the head, are frequently dangerous sources of fatal cerebral congestion, or of serous or sanguineous effusion. As in the case of epileptics, women in puerperal convulsions frequently die of apoplexy, produced by the immense pressure exerted on the cerebral column of blood during the fits. It is, I believe, in great measure from the effects of bloodletting in warding off accident from the brain that bleeding is so general in this disease. The due recognition of the distinct operation of bloodletting on the cerebral and spinal systems is of the utmost consequence. In plethoric states of the circulation, it is in this disease *curative* in its action on the spinal marrow, *preventive* in its action on the brain.

In the absence of definite ideas regarding the effects of bloodletting in this malady, it has been frequently pushed to excess, or practised where it should have been altogether avoided. In the numerous cases where, besides vascular excitement of the spinal marrow, some irritation of spinal excitor nerves exists as a conjoined cause of convulsion, repeated bleedings will often fail to subdue the disease, unless the eccentric irritation be at the same time removed. When irritation of the uterus, the rectum, or the stomach, is in part the excitor of convulsions, bleeding alone cannot be relied on. It may at first diminish the impressibility of the central organ, rendering it less susceptible of the incident irritation; but if persisted in to a large extent without the removal of the eccentric irritation, it becomes in the end positively injurious, by increasing instead of diminishing the excitability of the spinal marrow.

In vascular plethora, apart from albuminuria or uræmia, depletion is undoubtedly a sedative to the spinal marrow; but when the circulation is reduced considerably below par, loss of blood becomes an actual excitant to this organ. Hence it is that the reports of those who have most pertinaciously followed bloodletting, exhibit the loss of a greater number of patients than those who have been more cautious in this respect. The propriety and extent of venesection must be estimated, then, not by the violence of the disease, but by the state of the circulation in the interval of the fits, and with especial reference to the different effects of vascular plethora and vacuity upon the spinal centre. Patients rightly bled in the first instance, may be subjected to successive depletion until loss of blood itself becomes the cause of the final seizures.

Similar remarks would apply with almost equal force to the other parts of the common antiphlogistic regimen. Nearly allied to the *modus operandi* of bleeding are the effects of nauseating doses of emetic-tartar, which have been found so serviceable in the treatment of puerperal convulsions by Dr. Collins. It is more than probable that this remedy acts as a sedative on the spinal system through the medium of its effects on the circulation. In the convulsions occurring in delicate anæmic women, of course bleeding is inadmissible, becoming, in fact, under such circumstances, an exciting cause of the disease. Still, in cases approaching to this state, cautious bleeding may be sometimes necessary to preserve the brain from injury; but here venesection requires to be followed promptly by stimulants: such cases are, however, rare in comparison with those in which fulness of the circulation exists at the onset of the disease.

During the attack of convulsion, the glottis is partially or entirely closed. The greatest authority on this point, Dr.

Marshall Hall, questions if true convulsion could ever occur without this state of the glottis, and the cerebral and spinal congestion which it occasions. We know that the epileptic attack is sometimes warded off by the dash of cold water on the face or chest, so as to excite a sudden inspiration and the dilatation of the glottis. It is on the same principle, that of exciting a strong inspiratory act, that we stimulate the nostrils or sprinkle the face with cold water in syncope. Excitation of the incident nerves of inspiration has in the same way been known to prevent the puerperal convulsion. It is probable that, in extreme cases, tracheotomy would afford relief, and I should not hesitate about resorting to this operation when the patient was in danger of dying during the fit.

Harvey gives an instance in which stimulation of the trifacial nerve within the nostrils recovered a woman who became comatose during labour. Denman also relates an interesting case, in which a convulsion was excited during every labour-pain, but in which he kept off the attacks, until delivery was completed, simply by throwing cold water on the face with a bunch of feathers at each accession of pain. It was found that this mode of proceeding, from which he augured so favourably from its effects in this and other cases, did not prove equally efficacious on all occasions. He observes, that this is "a safe remedy," which cannot be said of all measures resorted to in this disease. It must certainly be productive of benefit in cases where the glottis is not so firmly locked as to render its dilatation by this means impossible. Even if it does nothing to prevent the accession of the fit, every time we can dilate the glottis, and cause a full inspiration, we take off a considerable amount of vascular pressure from the nervous centres, and lessen the proportion of venous blood in the system.

The application of cold is a therapeutic of some importance in this disorder. Cold, applied to the head in the form of napkins, lightly wrung out of cold or iced water, ice itself, or a full stream of cold water poured from a height, has become an approved remedy in puerperal convulsions. It therefore becomes an interesting question—How does cold thus used act on the nervous system? It may act as a sedative on the cerebral portion of the spinal marrow, or it may lessen the distended state of the cerebral circulation, and thus relieve the counter-pressure of the brain on the intra-cranial portions of the spinal system. Probably it acts in both of these modes.

When used in the form of the continuous douche, as sometimes recommended, it would, in addition, tend to excite acts of inspiration, and thus dilate the glottis. The primary sedative action of cold on the spinal centre would seem to be shown satisfactorily by the good effects of cold applied to the whole length of the spinal column in tetanus.

The application of cold to the spine as well as to the head, may hereafter be found beneficial in puerperal convulsions. Whenever cold in any form is resorted to, its use, except for the purpose of exciting the respiration, must be continuous, as the intermittent application of cold, locally or generally, would excite, instead of allay, the spinal system. The benefit derivable from cold appears to arise from its local action on the nervous centres, because in tetanus,—the purest form of increased morbid spinal action,—cold applied to the spine is serviceable, whereas, when applied to the whole surface of the body, it is extremely dangerous, and even fatal.

Some striking distinctions must be made respecting the administration of Opium in puerperal convulsions. If a dose of opium be given in this disease in a full state of the circulation, before bleeding, there is a dangerous aggravation of the disorder; while if it be given in puerperal convulsions in an anæmic subject, or after excessive depletion, it is sometimes of great service. If, in a case of convulsions, opium be given at the commencement, it is dangerous in its effects; but the same medicine is frequently valuable in the advanced stage of the same case when the vascular system has been powerfully depleted. Thus it would appear evident that in convulsions with a full state of the circulation, opium is a stimulant to the spinal marrow, while in convulsions with anæmia, it is distinctly sedative. It is certainly an important point in practice, that the effects of opium in puerperal convulsion depend on the state of the circulation; that in plethoric or inflammatory conditions it is always dangerous, while in anæmia and debility it may always be given beneficially.

The regulation of Emotion is of considerable importance in preventing the accession of convulsions when they are threatened, and in averting the return of the attacks, in the intervals where consciousness is retained. Mental excitement of every kind should be soothed, and avoided as much as possible. The sight of the infant, of alarmed friends or relatives, unpleasant intelligence, noises in the sick chamber, or still more trifling matters, have caused or renewed convulsions. Perfect quiet and repose within the sick room, and the absence of all signs of excitement on the part of the attendants, are of the utmost consequence; the calm or timid look of the professional man may either excite or prevent a fit.

During ordinary labours, care should be taken to avoid increasing the tendency to contractions of the muscles of the neck; this is still more important in labours with symptoms of spinal erethismus, or threatening convulsion. Care should be taken that, during the propulsive and expulsive stages of labour, the reflex contractions about the neck should not be increased by excessive voluntary efforts, or by violent emotional disturbance. When the neck becomes tumid at each returning pain, the reflex cervical contractions should be moderated by directing the patient, not only to withhold voluntary action of this kind, but to cry out during the pains, so as to keep the larynx open. In this way trismus, sphagiasmus, and laryngismus may be prevented by volition, in some cases. If the cervical symptoms are severe, venesection should be practised before the accession of convulsion, as a preventive measure. Whenever great fulness of the neck occurs, either before or after labour, so as to create an apprehension of convulsion, blood should be taken from the head by leeches, or by cupping. There is no point of greater importance in the prophylaxis of puerperal convulsion than an attention to the state of the cervical region; it is to convulsion what the pulse is to inflammation.

In threatened convulsion, or after the invasion of the disease, it is of the utmost importance to seek out and remove all sources of reflex irritation. Remote causes of irritation should be sought for, and removed with the greatest care. The state of the Stomach, the Intestines, the Breasts, the Bladder, and other organs in reflex relation with the uterus, should be examined. If the fit should have occurred for the first time after a full meal, or after indigestible food, an emetic of sulphate of zinc should be administered. If there should be vascular fulness, venesection ought to be performed. The bleeding should precede the emetic, to diminish the danger to the cerebrum from the action of vomiting, for emetics given incautiously have occasionally produced sudden death in puerperal convulsion. However, when the gastric irritation is undoubted, no patient should be suffered to continue in the fits with the stomach unrelieved. It may seem superfluous to urge this, but I have known cases of convulsion from gastric irritation, in which the most sedulous attention has been shown to almost every other organ in the body, except the right one. Still more important than the stomach is the state of the bowels. In convulsions the intestines are very commonly loaded; it immediately becomes a question how to relieve them without producing greater irritation by the operation than already exists from their loaded condition. The most violent drastics have been given in such cases without any ceremony, as though the more rudely the *materies morbi* were grasped, the more effective the remedy. But it is of great importance to avoid irritating the intestinal canal unnecessarily. I have known puerperal convulsions produced by giving a brisk cathartic too soon after delivery. In fact, there is little difference between irritant drugs and irritant fæcal matter. Therefore, whenever the bowels can be opened without purgatives administered by the mouth, but by aperient enemata, the latter are greatly to be preferred. When we give a cathartic, we never know how long it may remain to fret the bowels, but an enema is sure to return almost immediately. Washing out the bowel is less irritating than drastic purgatives, and often effective in removing fæcal accumulations. A copious enema of warm water, repeated until free evacuation has been produced, has sometimes relieved convulsion. If the warm-water injection should be insufficient, castor-oil, or turpentine, may be added. Sometimes the constipation is so obstinate as to refuse to yield either to enemata or cathartics, and the contents of the bowels positively require to be dug out. I have seen a case of this kind in which their excavation was followed by the almost instant relief of violent convulsions. The state of the bladder should always be attended to in puerperal convulsion, particularly as, during the insensibility of the intervals, the patient is unable to inform the attendant of its distended condition. This may be a slight thing to mention, but the catheter has sometimes relieved convulsion when the lancet has failed.

But the great seat of reflex irritation in puerperal convulsion is in the parturient canal. There is only one direct mode in which uterine irritation can be delayed during puerperal convulsion, except by the removal of the fœtus. This is by removal of the liquor amnii. In cases of puerperal convulsion, puncturing the membranes takes off a considerable amount of distension from the uterus; diminishing the size of the organ, and the quantity of blood circulating through it. Hence, though it makes the uterus more active, by bringing its parietes into contact with the fœtus, it renders the organ itself less irritating to the general spinal system. The evacuation of the liquor amnii is to the uterus what the partial action of an emetic or an enema is to the stomach and intestines. In convulsion from uterine irritation, much may be done by the avoidance of all unnecessary dilatation and interference with the vagina and os uteri. During convulsions, all operations upon the parturient canal, whether they consist of examinations, dilatation of the os uteri, and the vagina, the artificial removal of the fœtus, or the extraction of the placenta, should be performed with the greatest care, and with the remembrance of the ease with which renewed fits may be excited by any irritation of the uterine passages.

The relation of Artificial Delivery to puerperal convulsion is a matter of deep interest. Some obstetricians have recommended that it should always be performed by turning, craniotomy, or the forceps, when the fits are obstinate and severe. In deciding this point, the particular characters of individual cases must be considered. The general principle which we may deduce is, that whenever artificial delivery can be effected with less irritation than would be produced by the continuance of the child in the parturient canal, and its expulsion by the natural process, it is advisable that it should be performed, if the situation of the mother be perilous. It must be with reference to this principle—namely, to the irritation of any particular operation, and the irritation of labour itself—that turning, craniotomy, or the forceps, must be decided upon. All these operations have destroyed patients; and, on the other hand, numbers have died undelivered, from uterine irritation. The question of interference is one for which no arbitrary rule can be laid down, but which must be decided in each individual case by its particular circumstances, due reference being had to the excitability of the uterus under the stimulus of the fœtus, and under artificial interference. The point to aim at should be, never to produce more irritation than we remove, and not to destroy the patient by an excessive temporary irritation instituted for her permanent relief, in the entire evacuation of the parturient canal. Of course, the greater the operation necessary for delivery, the greater is the deliberation necessary before it is commenced. In manipulating upon the uterus, under such circumstances, we must never lose sight of its reflex connexion with the spinal marrow. Such appear to me to be the principles upon which we must deal with the uterus in puerperal convulsion.

I now proceed to the consideration of the form of puerperal convulsion depending on Albuminuria. Since the present work has been in the press, an obstetric text-book has been published by Dr. Carl Braun, of Vienna, which contains the fullest account hitherto given of puerperal convulsions dependent on uræmia. An excellent translation of this part of Dr. Braun's work has been published by Dr. Matthews Duncan, and to this I am much indebted.

The subject of albuminuria, in connexion with childbearing, has already been adverted to in the chapter on the disorders of pregnancy. Puerperal convulsions depending on uræmia and albuminuria are, without doubt, the most important and frequent convulsive disease of parturition, and require special notice, as the treatment of such cases is distinct in some respects from that of puerperal convulsions occurring in the absence of albuminuria. Uræmic convulsions, as they are called, may happen during pregnancy, in the course of labour, or after delivery has taken place, but the greatest number of cases occur during the act of parturition itself. As already mentioned, this form of convulsions is centric in its origin, as regards the spinal marrow, and depends on the circulation of vitiated blood in the vessels supplying the nervous centres. The blood-poisoning consists chiefly in the retention of urea in the blood, and the loss of large quantities of its albuminous portion. The symptoms of albuminuria during parturition are the same as those of the disease in the course of pregnancy, but the œdema and general pallor is more marked, and towards the end of gestation, the quantity of albumen in the urine is increased. During labour, also, and especially during anæmic convulsions, there is an excessive amount of albumen in the urine. As women affected with albuminuria frequently pass through labour without convulsions, it is believed by many authorities that something akin to fermentation must occur in the blood, loaded with urea, and other excrementitious matters, and deteriorated by the loss of albumen, before convulsions can occur. In this fermentation, the urea is supposed to be transformed into carbonate of ammonia, and to this the convulsions are attributed as their immediate cause. It is found that the breath, sweat, and the blood itself, reveal the presence of ammonia. In the height of the disease, the urine is generally acid and small in quantity, or entirely suppressed. Its specific gravity ranges from 1010° to 1030°. Before the occurrence of convulsions, the reflex sensibility is increased; but during the fits it is observed to be diminished, and the eye may be irritated without causing contraction of the lid, while other parts of the body are observed to lose much of their susceptibility to reflex stimuli and impressions. The actions of the uterus are sluggish, but continue to a great extent independently of the fits.

The Causes of albuminuria have been adverted to when treating of the disorder as it occurs in pregnancy. Pathological evidence tends to show that the condition of the kidney which is present closely resembles an acute attack of Bright's disease. The urine is dark-coloured from the presence of blood corpuscles; and, examined by the microscope, cylindrical clots and cylindrical masses of epithelium from the tubuli uriniferi are found. In fatal cases, the structure of the kidney is discovered to be seriously altered from the normal condition by the presence of diffuse inflammation leading to degeneration of the renal structures. It is, however, remarkable, as separating this form of albuminuria from others of similar intensity, that shortly after labour, the urine becomes normal, and in a few days, or at most weeks, all traces of albumen and of renal disease disappear. It is remarkable that in some women, the albuminuria reappears in successive pregnancies.

The attack of convulsions is generally preceded by imperfect vision, sometimes amounting to total blindness, tinnitus aurium, irregular action of the heart, intense cephalalgia, and confusion of intellect. The phenomena of the convulsions themselves consist of spasmodic jerking movements of all the voluntary muscles, attended by complete insensibility. There is trismus with protrusion of the tongue, so that this organ is frequently bitten. Laryngismus and spasmodic contraction of the muscles of respiration, exist to such an extent as to entirely suspend respiration for some seconds at a time, and sometimes cause death from asphyxia. There is great congestion of the neck, face, and brain, with strong pulsation of the carotids and lividity of the surface. The pulse is sometimes frequent, at others slow. After the fit passes off, there is a state of torpor, and then consciousness, more or less complete, generally returns after the first fits. In the worst cases there is no return of consciousness, and as the fits increase in number, the state of torpor or coma between the convulsions becomes more continuous and profound.

As regards the Treatment of the form of puerperal convulsions depending on uræmia, the latest experience is against excessive bloodletting, and, indeed, against bleeding at all, except in the form of a single venesection at the outset of the disease, in patients of full habit. Chloroform has been found of great service in moderating the violence of the fits, and in rendering operations, such as the use of the forceps in turning, comparatively easy of performance. It is also believed that a transient diabetes mellitus is caused by the inhalation of chloroform, and that this condition neutralizes to some extent the saturation of the blood with urea or carbonate of ammonia, and that chloroform has thus a curative effect in addition to its anæsthetic influence. The remaining indication is to complete the labour, when the convulsions occur during the course of parturition, as early and with as little irritation as possible. As the rule, craniotomy should not be performed, on account of convulsions alone, unless there be evidence of the death of the child. The forceps should be used when the head is within reach, and the os uteri sufficiently dilated. It has been recommended in those cases where the head is high in the pelvis, to use the forceps after Hatin's method—namely, by introducing one hand entirely into the vagina while the blades of the forceps are being passed up, so as to direct them to the head. In cases of rigidity of the os uteri, labour should be promoted by the means used for the induction of premature labour. No means are probably superior to the injection of two or three quarts of warm water into the uterus itself, by passing a tube up between the membranes without rupturing them. Professor Braun recommends the introduction of a caoutchouc bag into the vagina, and its distension with water, as a means of dilating the os uteri, and also advises incision and cauterization of the os. Incision should, however, only be practised in cases in which it would be necessary if the labour was not complicated with convulsions; and the author referred to, gives no sound reason for the employment of cauterization. In this country it is sometimes the practice to perform craniotomy when the head is low in the pelvis, to avoid injury and sloughing of the perinæum: but the propriety of this may very well be questioned. It would be better to lacerate the perinæum by the use of the forceps, or even to incise it if necessary, than to destroy a living child. When the patient is sensible between the fits, she should drink copiously of diluent and diuretic drinks containing citric, tartaric, or benzoic acid. Cold should be applied to the head in the form of an ice-bag or a cold douche. Blisters to the nape of the neck are useful in preventing cerebral effusion. The bowels should be moved freely with compound jalap powder or purgative injections. The bladder should be watched, and the urine drawn off by the catheter, if necessary. These points of treatment apply especially to cases in which the convulsions occur either before or after delivery.

The fatal effects of convulsion upon the child have long been known. A large proportion of the children in such cases are born dead. This result is attributed in part to the influence of the continuous contraction of the uterus in such cases, in interfering with the placental circulation, but chiefly to the poisonous effects of the blood of the mother upon the child. It is found that children born alive after convulsions are affected with uræmia or albuminuria, and that this condition lasts in some cases for a considerable time after birth. Sometimes children born alive under such circumstances have themselves died subsequently of uræmic convulsions.

This fact of the blood of the fœtus *in utero* becoming diseased through the circulation of the mother, and producing albuminuria in the child, would render it probable that uræmia may sometimes exist primarily as a disease of the blood, and that the renal disorder may be a secondary affection.

It was also known to the older authors that inflammations of the serous membranes, as the pleura and peritonæum, were frequent after convulsions; and these affections are no doubt due to the poisoned state of the blood, as is also the tendency to mania observed in such cases. Although the renal disorder disappears so soon after the completion of labour, the anæmia, hydæmia, and general depravation of the blood which accompanies it, remains for months or even years before it is entirely removed. A tonic regimen, with the liberal administration of steel, will best promote recovery. Care must be taken not to confound the symptoms of excitement frequently attending this form of debility, with inflammatory disorder.

CHAPTER XLI.

PUERPERAL FEVER.

About three thousand mothers die in child-bed, annually, in England and Wales. This is an average of nearly eight deaths every day from this cause. The proportion of maternal deaths to the births, registered in a series of years, was found to be 1 in 189. This mortality, it must be remembered, occurs for the most part to women in the prime of life, and previously in the enjoyment of full and vigorous health. Amongst the causes of death during the puerperal period, the disease we are now considering is, of all others, the most important and fatal. The fatality from child-bed fever is, however, in the present day, moderate, when compared with the epidemics of former times, in which, of those attacked, positively none recovered; but though it is still little amenable to treatment when it occurs, there is reason to hope that Preventive Medicine may hereafter almost, if not entirely, eradicate this formidable disease.

The histories of puerperal epidemics and outbreaks show great diversity in the symptoms and progress of the disorder at different times. This disease evidently varies with the constitution of disease at the time it prevails, being at one time intensely inflammatory, at another time putrid, in its form. In some seasons and places the liver, in others the peritonæum, in others the uterus, in others the intestinal canal, have been attacked; and in some of the worst examples, pathology has found no other change after death than fluidity and altered colour of the blood. It may be said, in fact, upon a review of the numerous descriptions of puerperal fever, that there is hardly a form of fever or inflammatory disease which it has not, to some extent, resembled in character. The great diversities witnessed in this disease have led modern observers to assert that under the term "puerperal fever" many different and separate diseases had been described, such as phlebitis, peritonitis, hysteritis, enteritis, typhus fever, remittent fever, erysipelas, toxæmia, and other forms of disease. The tendency has been, in modern times, to dwell upon the special manifestation of the disease, and to consider that all the various phases of the disorder depend on some local disorder, or upon some specific combination of morbid phenomena. One after another, various morbid conditions have been thought to form the chief part of the disease. At the present day, the doctrine of uterine phlebitis may be said to hold this kind of pre-eminence, and there is a general tendency to consider that all the local and constitutional symptoms and pathological changes arise from this source.

The more puerperal fever is investigated and tracked, as it were, to its elements or origin, the less satisfactory does any partial or local explanation of its nature become. In the progress of such examination, it appears more and more evident that there is a puerperal POISON to which the lying-in woman is liable, and which produces all the varied phenomena of puerperal fever met with in different epidemics, localities, seasons, and constitutions. In one time or person, peritonitis is produced; in another, metritis; in another, phlebitis; in another, mammary or other abscesses; in another, low fever; in another, intestinal irritation; in another, dissolution of the blood, without a trace of local inflammatory disorder; and so on throughout the list of local or special disorders which have been described by various authors in puerperal fever. It may be questioned, even, if phlebitis ever occurs without a poisoned condition of the blood, produced either as the result of contagion, epidemic influence, or the absorption of putrid matter from the uterus.

Thus, in the earliest pathological arrangements, a great number of disordered states were grouped together as Puerperal Fever, without attempt at discrimination or analysis; next came a laborious separation of the different forms and manifestations of the disease; and the subject seems at the present time ripe for allying the numerous affections met with in puerperal fever together, in their origin from a common cause—namely, an Animal Poison or Zymotic Influence.

Of the occasional Sporadic appearance of puerperal fever and its allied disorders, there can be no doubt. In all seasons, taking large communities, or large areas, isolated cases are met with in different localities, and in the practices of different medical men, where single patients are attacked, and where the disorder is not so severe as to extend itself by contagion or infection. In these cases, when the poisonous element is produced by the patient attacked, it probably originates from the state of the blood incidental to delivery, or depends upon the absorption of irritating or putrid lochial discharges, decomposed coagula, or portions of retained placenta. A single case produced in this way, may become contagious, and cause the disease in other patients, through the medium of nurses or attendants. It seems to be clearly made out, that in cases of this kind, and, indeed, in all cases in which contagion or infection is concerned in the propagation of puerperal disease, the risk of the spread of the disorder is greater in proportion as the cases which first occur approach the adynamic type. In inflammatory cases, the risk of the communication of the disease is less than in the purer forms of fever. The most convincing proof of the sporadic origin of some cases of puerperal fever is found in those instances in which single cases occur, and no other cases happen either in the same neighbourhood or at about the same time.

As distinct from the sporadic appearance of puerperal disease, we have Epidemics of puerperal fever, or puerperal inflammation, in which the disease, in its various complications, rages in certain hospitals or districts, being very dangerous at the outset, attacking the patients of different medical men simultaneously, prevailing for a certain time, and then becoming weaker and more manageable in type, until at length it disappears altogether. Epidemics of puerperal fever originate in the crowding of puerperal women together; and in the epidemic prevalence of erysipelas, hospital fever, typhus, or other disorders allied in their nature to the puerperal disease. In epidemics of this, as well as of other disorders, it is exceedingly difficult in any given case to prove whether it arises from epidemic or contagious influence. The best proof we have of the existence of puerperal fever in an epidemic form, is drawn from those examples in which the disease appears in certain towns or districts, and affects the patients of all the medical men alike, but is certainly not confined to the practice of one or two accoucheurs. It has been observed that when puerperal fever prevails epidemically in the human subject, the lower animals die in large numbers of diseases connected with parturition.

Besides the sporadic and epidemic appearance of this disease, we have, in my opinion, evidence as irrefragable as that which can be advanced in the case of any other malady whatever, that it sometimes rages as the result of Contagion and Infection. Those who deny the influence of contagion magnify the facts relating to the sporadic and epidemic prevalence of this disorder, and seek to apply them to the universal explanation of cases in which contagiousness appears most manifest. It is natural, observes Dr. Farr, for any man to shrink with horror from the supposition that he has communicated so fatal a disease to his patients, and to be disposed to receive any other explanation than that which refers it to contagion. Nevertheless, the interests of truth and humanity demand that the evidence of the contagiousness of puerperal fever should be put prominently forward.

The following are examples of the kind of evidence which exists in proof of the contagiousness of puerperal fever, and it may be unnecessary to state that facts of a similar kind to those here advanced might be multiplied to almost any extent.

A practitioner, for instance, had been attending cases of typhus fever. Within the space of four days he delivered five women. All these women were attacked with puerperal fever, and all of them died. This was in a country practice, and the cases were remote from each other. Different practices intersected the practice of this medical man at various points, but no other cases were known to have occurred in the neighbourhood. Again, a patient suffering from typhus fever was admitted into a lying-in hospital, where she remained for a few hours only. In the beds on the right hand and the left of this patient were two lying-in women; both were attacked almost immediately with puerperal fever, and both died. In another instance a medical man was in constant attendance upon a patient suffering from gangrenous erysipelas, and between the 8th of January and the 22nd of March attended the labours of ten women; all had puerperal fever, and eight of the patients died. This was in a town of moderate size, and no other patients in the place were known to have had puerperal fever. In another recorded instance, two medical men, brothers and partners, attended in the space of five months twenty cases of midwifery. Of these, fourteen were affected with puerperal fever, a fatal result ensuing in eight cases. The only other known death from puerperal fever, in the same town, within the period named, occurred in the case of a patient attended by a medical man who had assisted at the post-mortem of one of these puerperal patients. After this disastrous period, the two brothers relinquished all their midwifery engagements for one month, in which time five of their cases were attended by other practitioners, and no instance of fever occurred in the course of that month. They then returned, and several fatal cases again happened. It is difficult to imagine anything more conclusive as regards the doctrine of contagion. A remarkable history to the same effect is related by Dr. Ingleby. Two practitioners attended a post-mortem where the patient died from this disease. The first was summoned in one direction to a midwifery patient, who was attacked with puerperal fever; the other attended two cases in succession, both of whom were seized with the same disease. Dr. Roberton, of Manchester, relates perhaps one of the most cogent instances of contagion and fatality on record. In the space of one calendar month, a certain midwife attended twenty cases belonging to a lying-in charity; of these, sixteen had puerperal fever, and all died. The other midwives of the same charity, working in the same districts, attended, in the same time, 380 cases, none of whom were affected with puerperal fever. In another large town, containing many thousands of inhabitants, and numerous medical men, fifty-three cases of puerperal fever occurred. Of these, no less than forty happened in the practice of one medical man and his assistant.

In the face of such facts as these, every one of which might be verified by name, date, and locality, it does not become us to hesitate, or give out an uncertain sound respecting the contagiousness of puerperal fever. It is better to know the worst, fear the worst, and guard against the worst, than to harbour undecided opinions. I have known several instances where medical men, believing in the non-contagiousness of the disease, or hesitating between the two opinions, had gone on attending patient after patient with fatal results, until convinced of the mistake they had fallen into by successive deaths. No doubt sporadic and epidemic seizures are sometimes mixed up with those of a contagious origin, in such a manner as to require much clearsightedness to penetrate the confusion; but the facts of contagion are, as it appears to me, placed beyond all question, and should never be lost sight of by practical accoucheurs.

Those who oppose the view of the contagious nature of puerperal fever, argue that the cases which seem most conclusively to demonstrate the communicability of the disease from one patient to another by the attendants, really depend on epidemic influences. They point also to the occasional sporadic appearance of single cases in different parts of the same city or district, in the practice of different medical men. It is also insisted upon that in some cases lying-in women have been exposed to the influence of surgical fever, or have been present in wards containing patients ill of peritonitis, without contracting puerperal fever. The very intensity of the contagious principle has been used as an argument against the existence of contagion. It has been said, How could any poison cling to an accoucheur for several weeks, as in those instances where medical men meeting with puerperal cases have relinquished practice for awhile, but on returning have brought the disease back with them? Great stress has been laid upon personal experience, as in the case of Dr. Meigs, who describes himself as having attended as the consulting physician upon numerous cases in an outbreak of the disease which occurred to another practitioner, but Dr. Meigs himself never took the disease to any of his own patients. It appears to me that these difficulties are much more easy of explanation than the difficulties attending those cases in which contagion seems to be most convincingly proved. Some persons may be more liable to convey infection than others, just as one individual is more prone to infection than another. At certain times, from reasons which we cannot understand, but which we know must exist, the human organism is in such a state that exposure to infection and contagion does not affect it. Nothing is more unphilosophical or unsound than in such a matter to base an opinion on personal experience, when that is opposed to general and almost universal experience. For a man to argue that because he has not conveyed contagion to his patients, contagion does not exist, is scarcely more reasonable than it would be for a soldier who has passed through a battle without a wound, to conclude that there was no danger in war. But perhaps one of the strongest arguments in favour of infection or contagion is drawn from the preventive treatment of the disease. All the greatest reductions in the mortality from this disease have arisen from measures calculated to remove infection and contagion. In the course of a few years the mortality in the great hospital of Vienna was reduced from 1 in 10 to 1 in 74 of the mothers delivered, by the precautions taken to prevent the inoculation and infection of lying-in women. In this country the disease is much less formidable than it formerly was—a circumstance which I believe to be greatly owing to the care taken in preventing the spread of the disease by contagion and infection.

It is further necessary to insist upon the fact, that the contagious principle in the case of puerperal fever, is not limited to the transmission of puerperal fever, nor to the communication of infection from one puerperal patient to another, either directly to the lying-in woman or by attendants or nurses, but that it may be conveyed in the shape of several other Animal Poisons. One of the most remarkable points connected with the puerperal poison is the fact, that, setting aside its sporadic and epidemic appearances, it may, in the first instance, originate from a variety of causes external to the patient herself. When once produced in this manner, in single cases, it may be propagated amongst puerperal women by infection and contagion. The exposure of puerperal patients to the influence of Hospital Gangrene will produce the disease. Medical men in attendance upon cases of Erysipelas have given their patients puerperal fever. It has been made out very conclusively by Semelweiss and others, that the miasms derived from the Dissecting-room will excite puerperal disease. Exposure of the puerperal woman to the poison of Scarlatina will give rise to puerperal disease in patients proof against the reception of scarlet fever itself. The mortality amongst child-bed women seized with Small-pox is well known, and such patients die with the symptoms of puerperal disease, in addition to the variola. With respect to the disorders named, and probably others also, such as putrid sore-throat and sloughs or abscesses, some law evidently exists by which they may all be respectively converted into the puerperal poison. The facts seem to warrant a belief in the UNITY of the Zymotic influence which produces all these various disorders.

An extraordinary circumstance connected with the poison of puerperal fever is, that it may be communicated in other forms to the nurses, or attendants, and even to males. The husbands of puerperal women may be attacked by sore-throat, erysipelas, or typhus fever. Within the last few years an accomplished physician-accoucheur of this metropolis was cut off suddenly by putrid fever, after examining a woman suffering from puerperal disease. In some of those cases where the same medical man has lost numerous cases in succession as many men, women, and children have died from fever o erysipelas, as those who have perished from the puerpera disease. Thus, we have evidence that erysipelas, gangrene fever, &c., in males, or unimpregnated women, may produce child-bed fever, and we have the converse proof that this fev may excite other dangerous disorders, as the result of contagion, in non-puerperal persons.

How is this subtle poison conveyed from person to person? In what media of communication can it lurk? Through what channels can it reach the puerperal woman? The clothes, hair, and touch of the person exposed to the poisonous influence have been supposed to be the chief means of infection and contagion; but very remarkable cases are on record, such, for instance, as when the accoucheur has shaved his head, changed the whole of his clothes, cleaned himself by hot baths and vapour baths, and soaked his hands in disinfecting solutions, and yet he has taken the malady about with him. I believe that in such cases the Blood of the person acting as the medium of infection is affected, and that by the breath, a certain halitus or infectious influence is given out, which acts upon the blood of the puerperal woman through her own lungs, and thus conveys to her system the germs of the disease. As this point possesses a practical bearing of some importance, I desire in this place to make a few observations which may explain the position I have assumed.

If we attend a post-mortem when the smell is peculiar, if we spend some time in a lying-in room where the odour of the lochia is very strong, or if we go into any very powerful smell, the taint evidently enters the body by means of the lungs, and can readily be perceived by the taste or smell, or its odour can be distinctly recognised in the saliva, in eructations from the stomach, or in the urinary, cutaneous, and other secretions. Although the party thus affected may not have been exposed to the miasma or smell but for a short time, his blood gives evidence of infection for many hours, and in some cases for several days afterwards. Some habits are more prone to receive and retain this kind of infection than others. It remains so long in certain cases, that the odour would seem to have a power of sustentation or reproduction, otherwise it is difficult to suppose that an odour to which the lungs have been exposed, it may be for a few minutes, can infect the blood and all the secretions for twenty-four or forty-eight hours. If we can trace in this way the influence of a bad odour, surely we may admit that the same thing may happen with reference to the wonderfully subtle poison or miasm in puerperal fever, or those influences which appear to be identical with the puerperal poison, and manifest similar results in the lying-in woman. I believe that the blood of the accoucheur may take up a dose of puerperal poison without manifesting any special results in his own system, and that he may communicate it through the medium of the lungs to his patient. In the case of a poison so subtle, the air we breathe unites the circulations of the accoucheur and patient, and renders them, as it were, one. This is probably one great mode in which animal poisons generally are diffused. We know that the blood of persons attending patients in scarlatina, measles, and small-pox is infected, although they are proof against the disease; and in one remarkable instance we have the positive proof that the blood is the medium of infection. I refer to cases in which pregnant women who have had small-pox in childhood, and are proof against infection, have, nevertheless, on being exposed to the poison, conveyed the disease to the fœtus *in utero*. Here the blood of the mother must be the medium of communication between the patient suffering from small-pox, and the ovum hidden in her womb, and the lungs of the mother must be the channel by which the poison enters the circulation. This illustrates very well what I mean by saying that the blood of the accoucheur, or the attendants, is one great medium which conveys the poison of puerperal fever. The saturation of the blood of the accoucheur, nurse, or midwife, may remain for a considerable time; and cases are on record in which every case attended by certain individuals for weeks or months have been affected by the disease. A practical point deducible from these remarks is, that in attending lying-in patients, after the slightest exposure to the puerperal poison, or to any miasma which can be converted into this poison, or its equivalent, in the lying-in patient, we should be especially careful not to go so near the head of the woman, as to establish any communication between the lungs of the practitioner and patient. In saying this, I do not mean that other means of conveying the poison, as by clothes, hair, hands, and the surface of the body, should not also be guarded against.

The fiercest outbreaks of this disorder have occurred in lying-in hospitals, or in hospitals where lying-in women are received with surgical and medical cases, and where erysipelas, gangrene, or fever have prevailed. On this account many have doubted whether lying-in hospitals are not mischievous rather than otherwise, in the present limited state of our knowledge of the means of preventing puerperal fever. Women confined even in misery and squalor in their own homes are less liable to this disease than patients collected together in hospitals, even when the greatest care as regards cleanliness and ventilation is observed. All lying-in women should, as far as possible, be removed from the neighbourhood of any contagious epidemic or infectious disease. It should be a rule of the practical accoucheur to have as little as possible to do with any of the animal poisons which give rise to puerperal fever. He should avoid autopsies, especially in cases of death from child-bed fever, or ordinary inflammation. The student should not attend midwifery cases while he is dissecting. After an attendance upon any suspicious case, the practitioner should change his clothes, or have them hung up in a room exposed to the fumes of chlorine. I have no doubt it would be useful for him to inhale the diluted fumes of chlorine several times a day, and after touching anything connected with any source of danger, to rinse his hands in a solution of chloride of lime or chloride of zinc. It is impossible to be too scrupulous, in a matter of such moment, and I have known some careful accoucheurs who, on entering a lying-in room, habitually wash their hands before making an examination.

In the preceding observations I have stated briefly the evidence and facts which favour the view that all the different forms and manifestations of puerperal fever depend on a specific poison, arising, in some instances, sporadically; in others prevailing epidemically; sometimes due to the zymotic influence present in erysipelas, typhus, gangrene, surgical fever, and some other diseases; communicable from patient to patient by the attendants; and whose earliest known effect is a disordered state of the blood of the childbed woman. I now proceed to describe the different secondary disorders traceable to the puerperal poison.

In the Adynamic form of puerperal fever, the effects of the poison are seen in their most terrible and virulent form. This type of the puerperal disease has prevailed in the most ravaging epidemics, and also in those outbreaks in which the contagious spread of the disorder has been most demonstrable. Occasionally, patients have been struck by the disease in the latter part of gestation, during the course of labour, or within a few hours after parturition. In other cases, two or three days have elapsed from the time of parturition before the invasion of the disease. In the worst cases, patients become at once delirious or lethargic, the pulse being very rapid, from 120 to 140 in the minute, and feeble. Sometimes acute pain is complained of, but more frequently there is in the worst cases little suffering beyond a feeling of indescribable anxiety and depression; sickness and the vomiting of coffee-ground matter distresses the patient in some cases. The countenance is commonly sunken and dusky, or deeply pallid, with the dark circle round the eyes strongly marked. The skin is not above the usual temperature, but covered with clammy perspiration. Tympanitic distension of the abdomen rapidly supervenes. Rigors or shiverings may or may not be present. There is little or no sign of reaction, and in the worst cases the patients die in a state of collapse within a short time from the first seizure. Of 88 cases recorded by Dr. Collins, death occurred in 2 cases in twenty-four hours, in 1 in twenty-seven hours, in 1 in thirty-six hours; 9 died on the second day, and 15 on the third, so that 24 perished in less than seventy-two hours. Dr. Ramsbotham states, in the worst cases this disease is more rapidly fatal than any other disease met with in this country, except cholera. Mr. Hey mentions an instance in which death followed in less than eighteen hours.

When, from the less virulent action of the poison, or the strength of the patient, the disease is more protracted, the same symptoms are present, but in a milder form and degree. The invasion of the disease generally begins on the second or third day, and is commonly ushered in by shivering. There is in the earlier stages increased heat of skin. The tongue is sometimes coated, at others red; but, as happens with every variety of puerperal fever, cases are sometimes met with in which, from the commencement to the termination, the tongue remains tolerably clean. The prostration is less profound, and there is pain in the abdomen. Profuse sweating is a very common and distressing accompaniment of the disorder. In some cases this is so strongly marked, and constitutes so large a part of the disease, that Dr. Blundell described it as a distinct form of puerperal fever, under the name of Hydrosis. The sweat and the breath are very often accompanied by a sweetish pus-like odour. The sweating of puerperal fever does not diminish the secretion of urine, nor does it abate the quickness of the pulse. An intolerable thirst prevails, and the patient drinks immense quantities of whatever fluid she may be allowed. Dark spots, or ecchymoses appear upon the wrists or other parts of the body. After two or three days profuse diarrhœa occurs; but though it often appears to be critical in its nature, it brings little or no relief, and the patient is harassed by frequent dejections and vomiting. The lochia are commonly but not invariably suppressed. More frequently, the breasts become flaccid, and without secretion; but this is not always the case. The pain is often intermittent, even in cases where it is most severe, sometimes giving the attendants and the medical practitioner the hope that it may be of the nature of after-pain. In some of these cases the mind is remarkably clear, until towards the termination of the disorder. One of the most constant and distressing symptoms is tympanites. This comes on very rapidly, in severe and acute cases, and soon rises to such a height as to interfere with the action of the diaphragm and heart. The patient may, in a few hours, become larger than she was before delivery. Considerable quantities of flatus may be discharged, but no diminution of size is perceptible, the distension appearing to depend on an immense secretion of air by the mucous membrane, with paralysis of the muscular coat. In the course of the disease, obscure symptoms of uterine inflammation, with enlargement of the organ, or of peritonitis, pleuritis, or pneumonia, are met with. When the disease proceeds to a fatal termination, the patient succumbs to exhaustion, the action of the heart becoming more frequent and feeble, congestion of the lungs, or effusion into the pleural or pericardial cavities taking place, and low delirium or coma is present for some time before dissolution. In the rare cases which terminate favourably, the sweating, purging, or diuresis, appears to relieve the patient, and she slowly recovers from a state of great debility, remaining long afterwards in a condition of extreme weakness both of mind and body. In comparatively few cases, the chief symptoms of the disease are gastric, bilious, and enteritic irritation, but these are amongst the more favourable forms of puerperal disease.

The morbid changes met with after death are very various. In the most rapidly fatal cases nothing has been met with beyond non-coagulability, thinness, and blackness of the blood. The blood in these cases resembles that of persons killed by lightning or hydrocyanic acid. There may be no signs whatever of any local inflammation, or disease of the uterus or other organs. In the less virulent and more protracted cases, purulent infection of the blood has been detected, and pus has been found in the veins and other structures of the uterus. Congestion of the lungs, gangrenous abscess as in these organs, or effusions of mixed pus, serum, and lymph into the pleuræ, have been observed. In other cases, spots of ulceration in the stomach and intestines, or purulent collections in the liver and kidneys, are recorded. Abscesses in the omentum have been frequently found, so have effusions of sanious pus and feebly organized lymph in the peritoneal cavity, particularly about the uterus and its appendages. The internal surface of the uterus and the muscular structure have been found softened and in a state approaching to gangrene, particularly in the posterior part of the organ.

It has been mentioned that sporadic cases of puerperal disease are sometimes caused by the absorption of sanious lochial discharges, or the decomposition of coagula or portions of retained placenta within the uterus. There is also another mode in which sporadic puerperal fever may occur. There is some peculiarity about the state of constitution which obtains in pregnancy and parturition, tending to assimilate numerous other affections to the puerperal type. It may be seen, that in the case of a healthy pregnant woman attacked with smallpox or scarlatina, before abortion or premature labour is produced, the disease begins to assume the puerperal type. At any other time than after parturition, the presence of putrid matter in the uterus does not generally excite any great constitutional disturbance, as witnessed in the case of polypi removed by ligature. Even inflammation of the os or cervix, excited by a difficult labour, sloughing of the vagina and external parts, the inflammation of fibrous tumour, or peritonitis, caused in the first instance by the violent contractions of the uterus, has a tendency in some depraved states of constitution to run into puerperal fever. After the Cæsarian section, the patient suffers from an almost exact likeness of puerperal fever. Dr. Simpson very ably draws a comparison between puerperal and surgical inflammations and fevers, and refers this similarity to the resemblance which exists between the uterus after labour and a wound after the surgical operation. No doubt this is true to a great extent, particularly as regards the occurrence of phlebitis. But there is in the pregnant and parturient woman a state of constitution which predisposes her to the formation of some virus or POISON, capable of producing the puerperal type even before delivery, or even before the commencement of labour. This is especially the case after mechanical injuries of the gravid uterus. It is also observed, in cases of peritonitis, pleuritis, or any other visceral inflammation occurring during pregnancy. Before the uterus has been excited to expel its contents, there is an approach to the peculiar puerperal type of disease. If a gravid woman be attacked with erysipelas, she may suffer from the symptoms of puerperal fever or inflammation before the birth of the child, and the infant may, when born, be affected with erysipelas, and die within a few hours after birth. Thus, then, it seems capable of demonstration that, apart from the state of the internal surface of the uterus after parturition, and especially that part of it from which the placenta has been separated, there is in the habit and constitution of the gravid woman, some peculiarity which, under numerous circumstances, produces the virus or poison which gives their chief characteristics to the multiform varieties of puerperal inflammatory and febrile disease. Amongst the predisposing causes of puerperal fever in any of its forms, anxiety of mind and depressing emotions during pregnancy, or at the time of labour, hold a very prominent place. This is strongly insisted on by Dr. Fleetwood Churchill and many other writers. Undoubtedly this cause is a main agent in the production of some of the sporadic cases of this disease. Dr. Churchill observes, "Several of the worst cases I have seen were mainly attributable to this cause."

In many cases of puerperal fever, Peritonitis of a more or less acute form constitutes the chief part of the disease. In many epidemic outbreaks, inflammation of the peritoneum has been so constant as to give rise to the opinion that peritonitis formed the essence of puerperal fever, and puerperal peritonitis and puerperal fever came to be used as almost synonymous terms. This was very much the state of medical opinion up to the time when Guthrie, Bouillard, and Dr. Davis initiated the doctrine of phlebitis and purulent infection of the blood, so ably and laboriously worked out by Dr. Lee and others. Recent outbreaks of the disease have not manifested the peritonitic type so strongly as previous epidemics, but cases not unfrequently occur, in which the peritoneal disorder is the chief local manifestation of disease.

In Puerperal Peritonitis, or puerperal fever with peritoneal inflammation, the disease usually commences within two or three days after parturition, and seldom later than a week after labour. As previously mentioned, cases are on record, in which it has commenced before the beginning of labour, or during the course of parturition. I have referred to the influence of contagion and infection in producing this form of disease. Patients with easy labours, and without a sign of inflammatory disorder, may have puerperal peritonitis as the result of contagion or infection, when exposed to erysipelas, gangrene, or any of the disorders mentioned in connexion with the production of puerperal fever. It may also arise from injury of the peritoneum during the course of violent labours, or from exposure to cold. When caused in these modes, it is almost universally converted into the febrile puerperal type. In some cases it is an extension of disease from the parietes or internal surface of the uterus, and in others it is a result of uterine phlebitis. The disease may involve the whole peritoneal membrane, or it may be localized in the neighbourhood of the uterus, Fallopian tubes, and ovaria.

The Symptoms of puerperal peritonitis are generally in stronger relief than the symptoms of any other form of puerperal fever. Tenderness, pain, and exquisite sensibility of the abdomen to the touch, particularly in the neighbourhood of the uterus, is generally observed. Yet pain is not always present. On the contrary, it is entirely wanting in some of the most rapidly fatal cases, and where post-mortem examinations have proved peritonitis to exist. Dr. Ferguson found, that out of 173 cases, this symptom was absent in 19. The pulse is invariably rapid, usually remaining throughout the course of the disease at from 120 to 140. This is the symptom which in every variety of puerperal fever never fails of expressing truly the condition of danger. It has often been remarked, that whatever the other indications may be, the puerperal woman is never safe whose pulse rises steadily above 100. This is of course subject to many exceptions, but it expresses a general truth. In puerperal peritonitis, the pulse is quick from the termination of labour, and it has been observed that where this disease is threatened, the subsidence of the circulation which is natural after labour does not take place. The rising of the pulse is one of the earliest symptoms of peritoneal inflammation. Before the commencement of pain, rigor or shivering almost invariably occurs. Sometimes it does not amount to more than a prolonged creeping over the surface of the body; at others, it is so marked that the teeth chatter, and the patient asks to be held in bed, so violent is the muscular shuddering. While the rigor is most distressing, the surface of the body is little, if at all, below the natural standard. The state of the tongue is variable—sometimes red at the edges, with a white streak in the centre, at others coated or red, and sometimes without much decided alteration from the natural state. When the general tissues of the uterus are involved, this organ is swollen, and can be felt distinctly and painfully, until the rising tympanitis disguises it. There are cases in which the uterus attains a very large size, after having contracted subsequent to labour. The tympanitic distension which ensues is often very great, and the swelling of the abdomen is sometimes further increased by effusion of sero-pus into the cavity of the peritoneum, when the surface acquires a peculiar doughy or boggy feel. Sickness is very constantly present in this disease, and adds greatly to the suffering of the patient, from the compression of the abdomen by the efforts at vomiting. Dysuria is complained of, and the urine is scanty and high coloured. As the disease progresses, purging commonly supervenes, the motions becoming dark and offensive towards the last. Throughout, the breathing is short and painful, and cephalalgia is often present. Beyond this, the brain is frequently unaffected until the close of the disease approaches. The physiognomy is from the first distressing and pinched, so as to be almost of itself characteristic of the disease. No one who has ever seen the disease can mistake the indications afforded by the countenance and the pulse. The dark areola surrounding the eyes, the dilated pupil, the glassy surface and bloodless conjunctiva, give a lustrous and unearthly appearance to the eyes in most cases of puerperal fever, whatever the special complication, when the disease is fully formed. Occasionally, in this disease, there is an appearance of the sudden transference of disease to the pleura, and, more rarely, to the serous membranes of the brain. When the peritoneal inflammation is chiefly limited to the uterus and its appendages, the symptoms are somewhat less severe, and the pain more local, than in general peritonitis, being felt most distinctly in the iliac regions, and sometimes on one side only. With the local peritonitis, there is frequently inflammation of the broad ligaments, the sub-peritoneal cellular tissue, the Fallopian tubes, and the ovaria. Suppuration and abscesses sometimes form in these structures, and in the most favourable cases either burst spontaneously on the surface of the lower part of the abdomen or into the vagina or rectum, or they sometimes admit of puncture and artificial evacuation.

A fatal result is almost invariable when pus is formed in any considerable quantity upon the peritoneal surface.

The pathological changes consist of effusions of pus or of lymph, rarely so highly organized as after ordinary peritonitis; sero-purulent effusions and abscesses of the surface of the uterus or its appendages, or of the omentum. In many cases, the uterus is found diseased, the inflammatory disorder having extended from the uterus to the peritoneum, or, probably, in some cases, from the peritoneum to the uterus. Softening of the parietes, patches of gangrene, abscesses in the walls, and collections of pus in the veins of the uterus, are often met with.

One of the greatest, if not the greatest, advances ever made in the pathology of puerperal fever consists in the knowledge we have obtained, in recent years, of the existence of Uterine Phlebitis as a very common and destructive form of puerperal disease. The occurrence of uterine phlebitis and suppuration of the veins in isolated cases had long been known, but no other inquiries have at all equalled the researches of Dr. Robert Lee in this particular department, and it is to his extended investigations of the subject that we chiefly ow the establishment of the doctrine of uterine phlebitis as it occurs after parturition. Others have, as I believe, wit truth, controverted Dr. Lee's views of the entire dependenc of puerperal fever upon uterine inflammation and phlebitis and it may, I think, be shown, that where phlebitis exists, i is, in almost all cases, an expression of constitutional disorder and especially of a poisoned or diseased state of the blood rather than an idiopathic disease. The researches of Dr. Fer guson and others prove that puerperal fever may destro patients before there has been sufficient time for the occu rence of phlebitic inflammation, and that in such cases n pathological changes beyond a diseased state of the blood ar met with. Many facts in the history of puerperal fever prov that before the purulent infection of the blood, believed b Scanzoni and others to constitute the essence of the diseas has taken place, changes have occurred in the circulatin fluid, which may in some cases destroy the patient long befor the suppurating stage has been reached. The experiments Dr. Mackenzie, and the cases he has collected, show that th healthy obstructive inflammation of the veins, the result simple traumatic injury, does not result in purulent infectio of the blood, but that a morbid state of the circulating fluid i necessary to the production of pyæmia. Recently, the researches of Virchow have tended to show that all the phenomena of phlebitis depend on the formation of coagula in the veins, and the transformation of these coagula into pus and other elements.

Uterine phlebitis generally commences on the second, third, or fourth day after labour, with shivering or rigor, and a marked increase in the quickness of the pulse, which ranges throughout from 110 to 140 and 150. There is usually pain in the hypogastric, or one of the iliac regions, the pain becoming more evident upon deep pressure. There is also pain in the back, or in one or both hips, extending downwards to the thighs. The pain is generally intermittent, and is sometimes absent for many hours. The patient is usually anxious to be quiet, every movement of the body greatly increasing the pain, when this symptom is present. But in a considerable number of cases the pain alone is not so marked as to indicate the dangerous state of the patient, and in some instances it is absent altogether. The lochia may become offensive at the commencement of the disorder; they may be scanty, or they may remain in normal quantity and quality. The mammary secretion is usually suspended; but in some cases it continues until the patient is exhausted by the progress of the disease. The perspiration is very distressing and constant, and after three or four days from the commencement of the attack, diarrhœa is generally present. At intervals, throughout the course of the disease, violent rigors are felt, which may be supposed to mark successive formations of pus, or the commencement of inflammation in other organs beside the uterus. The state of the tongue is very variable, and it may be red and glazed, or covered by a creamy fur, or scarcely altered from the natural state. The complexion of the patient is at first little altered, except by the presence of a hectic spot on each cheek. The mind is clear, but the speech and movements of the patient are tremulous. The patient often sleeps tolerably well, and frequently expresses herself as feeling better; but her manner is anxious and trembling, thanking those about her so nervously for the slightest attention, that her state in this respect has often been compared to the incipient stage of puerperal mania. The tympanitic distension of the abdomen is not the least distressing symptom, giving rise to hiccup, vomiting, and greatly interfering with the respiration and the action of the heart.

As the disease progresses, the secondary phenomena of uterine phlebitis and the formation of pus within the veins become evident. The patient complains of pains in some joint or joints; swellings appear in the neighbourhood of the articulations, and erysipelatous blushes appear on the skin in different parts of the body. The hips, knees, shoulders, and elbows are the joints most commonly attacked. Large suppurations in the vicinity of the joints occur, or patches of slough or gangrene form at the sites of the erysipelatous blushes. Sometimes the secondary inflammation attacks the eye, especially the left, leading to rapid destruction of the cornea. These external suppurations, however painful and exhausting, may be considered somewhat in the nature of crises, and as giving some faint hopes of recovery. Up to this point, up to the time, in fact, when external suppuration begins, it is acknowledged by the best authorities that we have no positive signs by which we may be sure of the existence of phlebitis. This is stated with great candour by one of the latest and best writers on the subject, Dr. McClintock, of Dublin. In other cases the secondary inflammations and suppurations are internal, and attack the lungs, liver, kidneys, omentum, or other organs. Such complications are more dangerous than the external secondary abscesses. These phenomena cannot exist without the pyæmia, of which they are the results, indicating its constitutional effects. When pus is present in the veins, the inflammatory symptoms subside to a considerable extent, and adynamic or typhoid symptoms frequently manifest themselves. It is necessary, however, to distinguish between the low state of system thus produced and the somewhat similar condition which exists in the first instance, when the puerperal virus is very potent, and before any inflammation o suppuration has progressed in the veins. When patients recover, they slowly struggle through the exhaustion produced by the extensive suppurations, and may remain blind o with anchylosed joints, to bear witness to the terrible orde through which they have passed. When a fatal result ensues the patient dies with symptoms very similar to those described when speaking of the adynamic form of puerpera fever, or exhausted by the discharges consequent on the external suppurations.

The tendency of the puerperal and other forms of pyæmi to attack the joints, is a very remarkable feature of this af fection. Large effusions of pus and sero-purulent fluid are poured out in the joints affected, and the cartilages are often eroded and destroyed to a remarkable extent. No explanation has hitherto been given of the reasons why the joints, the eyes, or the serous membranes should be especially selected. I would suggest the probability, that this selection may depend on the nourishment of parts of the eye, cartilages, and serous membranes, by the non-vascular permeation of the tissues by the liquor sanguinis, as explained by the researches of Mr. Toynbee. The diseased liquor sanguinis, or in purulent infection of the blood, the liquor puris, may easily be supposed to affect especially those tissues of the body in which special provisions exist for their permeation by the colourless parts of the blood. One of the earliest, as well as one of the most graphic descriptions of puerperal affections of the joints we owe to Mr. Coulson, who has described the careful dissection of numerous cases of this kind.

Besides uterine phlebitis, other forms of puerperal inflammation of the uterus occur. That which affects the Lymphatic vessels does not materially differ in symptoms, progress, and termination from phlebitis. Inflammation of the Muscular tissue and lining membrane of the uterus is characterized by great disturbance of the nervous system, distressing cephalalgia; and is attended by fever of low type. Occasionally the cerebral symptoms are so intense as to entirely mask the uterine disease. It is ushered in by the same symptoms as regards rigors, acceleration of the pulse, and state of tongue as those which attend the other varieties of puerperal inflammation. Its tendency is to produce softening, suppuration, and gangrene of the substance of the uterus, and it is one of the most fatal of all the puerperal inflammations.

Before speaking of the Treatment of Puerperal Fever in its varied forms, it cannot be too much insisted on that it is a disease, almost above all others, open to *Prevention* rather than *Cure*. The avoidance of injuries of the uterus or vagina in difficult or instrumental labours, the entire removal of the placenta, and the promotion of a free lochial discharge, with the avoidance of the possibility of inoculating or infecting the puerperal woman with any of the poisons which admit of conversion into the puerperal poison, are of the greatest importance in preventing the appearance or extension of this terrible disease. As regards the actual treatment, nothing can be more different than that which has been most successful, or best borne in different epidemics, and at different places and times.

The opposite extremes of puerperal fever—namely, the peritoneal and inflammatory, and the adynamic, are those which most distinctly admit of positive rules of treatment. In puerperal peritonitis of an active type, copious venesection, the free use of leeches, mercurials, opium, fomentations and stupes, or warm poultices to the abdomen, counter-irritation, and mild aperients, are the means upon which we must depend. The bleeding must, however, be prompt to be of service, and its extent must be measured by the powers of the patient and the intensity of the disease. A full bleeding to twenty or thirty ounces at the onset of the disease will often in an acute attack do more to relieve the patient than any subsequent treatment. She should be bled in the upright position to incipient syncope, and the bleeding should be repeated in a few hours, or the abdomen covered with three or four dozen leeches. At the same time, calomel with opium or Dover's powder should be given in repeated doses at small intervals, with a view to the production of ptyalism, or mercurial inunction should be resorted to. When general and local bloodletting have been carried as far as the patient will bear, and when the disease continues, a large blister over the abdomen is of great service. In all cases of puerperal peritonitis, there comes a time, unless the patient has been rapidly destroyed, in which stimulants are required. It is only in the most acute forms of puerperal peritonitis that an active depletory plan of treatment is admissible. In peritoneal disorders of a lower type, depletion must be more sparingly employed, and a tonic and stimulating plan earlier resorted to.

In the most adynamic cases of puerperal fever, a stimulating treatment must be adopted from the first, and wine, brandy, ammonia, and quinine are required. The only antiphlogistic remedy that can be resorted to in such cases is blistering. In milder, or more mixed cases, a small bleeding at the very commencement is sometimes called for, or the application of a few leeches; but as the patient passes rapidly into the low stage of the disease, support and stimulus become necessary. The treatment, under these circumstances, is little different from that required in marked cases of typhus fever.

In phlebitis, the employment of bleeding is a vexed question. Some authorities have strongly recommended early bleeding, and others have opposed it, advocating a tonic regimen, and directing all their efforts to the preservation of as healthy a state of the blood as possible. In one instance, in this metropolis, bleeding was tried on a large scale in a lying-in hospital, where venesection was performed on the very first approach of the disease, and the mortality was greater than when an opposite plan was adopted. In the present state of our experience in this disease, bleeding appears to be called for at its commencement, when the pain is acute and the pulse rapid. But this disease is often so insidious, and its progress attended by such remissions, that it is difficult, if not impossible, to decide on bleeding until distinct evidences of pyæmia have appeared, when bleeding becomes injurious rather than otherwise. As soon as this becomes evident, cinchona, nitric acid, chlorate of potash, ether, ammonia, strong animal broths, wine, and brandy, are agreed upon by all authorities as the best line of treatment. Whenever, within my experience, a recovery has taken place from a bad attack of puerperal fever, especially when phlebitis has existed, a very free and continuous administration of wine and brandy has been the line of practice followed. It appears as though the filling of the vessels with alcohol will do more to neutralize the poison of puerperal fever than any other remedy. Pain must be allayed by opiates, and the painful joints bathed with opiate embrocations or a chloroform liniment. When collections of matter are evident upon the surface, they should be opened, and it is believed that the external discharge of pus adds somewhat to the chance of recovery. Congestion of the lungs or brain must be met by sinapisms or blisters, and the meteorismus relieved, as far as possible, by carminatives, turpentine enemata, or the introduction of a tube into the intestinal canal. It is impossible to do more than lay down general principles, and indicate the points of treatment, within the scope of a work like the present. A patient suffering from the disease now under consideration will tax all the resources and all the vigilance of the most able and painstaking practitioner.

CHAPTER XLII.

PHLEGMASIA DOLENS—PUERPERAL ARTERITIS—SUDDEN DEATH IN THE PUERPERAL STATE.

Phlegmasia Dolens, though generally a disease of the puerperal state, is not limited to this period. It sometimes occurs during the course of pregnancy, or towards the end of lactation. It may also happen independently of child-bearing, in dysmenorrhœal patients; in women suffering from carcinoma, or the subjects of metritis; or after the operation of tying a polypus. In still more rare cases, it has been met with in the male subject, as the result of cold or local irritation.

Pathological researches show that the disease essentially depends on Obstruction of the Veins of the lower extremity. This is proved by the dissections of Dr. D. Davis, Dr. Lee, M. Bouillard, Virchow, and numerous other investigators. The veins affected are, the crural, iliac, uterine, vaginal, the saphena, and sometimes the vena cava. The obstruction, in some cases, consists of fibrinous coagula, and in others of coagulated lymph, or pus. The whole of the affected limb, and frequently the vulva, is, as the disease progresses, gorged with serous effusion, and in some cases the lymphatic vessels and nerves of the extremity show the existence of inflammation in their structures.

The mode in which the obstruction of the veins is caused is not at the present time a settled matter. Dr. Lee believes it to depend on inflammation, extending from the uterine to the iliac and crural veins. But cases are met with in which the obstruction is limited to the veins in the lower part of the leg, or in which it appears in the upper extremities, without symptoms of local uterine phlebitis. The most recent doctrine—that founded by Virchow upon his numerous dissections—is that the first pathological condition consists in the formation of a coagulum in the vein; and that the inflammation of the vein, effusion of lymph and pus, and the breaking-down of the coagulum and formation of pus in its substance, are phenomena which result from the plugging of the veins. It appears, however, that the evidence of the extension of irritation or inflammation from the uterus to the veins, in many cases, cannot be rejected. This inflammation of the internal coat of the vein appears to cause coagulation of the blood circulating within the vessels. In other cases, the presence of vitiated blood in the veins seems to cause coagulation and plugging, without the intervention of inflammation. When a firm plug is formed from any cause, patients go through the phenomena of pure phlegmasia dolens. When it is loose, or breaks off, the circulation generally becomes vitiated, and other symptoms besides those of phlegmasia dolens are manifested.

The inflammation of the lymphatics and nerves occasionally met with is probably of a secondary nature, and dependent on the profuse infiltration of the tissue of the limb with serum of a highly acrid and irritating character. The whole subject is one, however, in which pathological investigations are not as yet definitely agreed.

The affinity between phlegmasia dolens and ordinary puerperal phlebitis and fever are strongly marked. In some cases of phlegmasia dolens, the inflammation is not limited to the veins of the lower extremities, and suppuration occurs in other parts of the body, and in the eyes, as in ordinary puerperal phlebitis. In other cases, inflammations of the serous membranes, as the pleura or peritoneum, are found in combination with the inflammation of the crural vessels, and the patients die of precisely the same symptoms as those met with in ordinary puerperal phlebitis, or puerperal fever. I have also seen cases which tend strongly to prove that phlegmasia dolens may be produced as the result of infection. For instance, a short time ago, a friend of mine had been in close attendance upon a patient dying of erysipelatous sore-throat with sloughing, and was himself affected with sore-throat. Under these circumstances he attended, within the space of twenty-four hours, three ladies in their confinements, all of whom were attacked with phlegmasia dolens.

The common period for the invasion of the disease is between the end of the first and third week after parturition. For a day or two before the presence of any local symptoms in the extremities, there is great depression, restlessness, irritability, and fever, with or without pain in the uterine region. During this time there is frequently chilliness, or a distinct rigor. The first pain in the leg is usually in the calf, and is very intense and distressing; sometimes the pain is first felt in the ankle, knee, groin, or hips. In some cases, the part first complained of is red, but it is often perfectly pale. Within twenty-four hours from the onset of pain, the part affected generally swells and becomes white, tense, and shining. It generally pits on pressure, particularly at the beginning. When the swelling commences in the groin or hips, it commonly extends downwards, but, if the ankle be the first part affected, the swelling ascends, so that in either case the whole limb usually becomes affected. Sometimes it is, however, limited to the parts below the knee. The femoral vein is always, when the disease involves the whole limb, hard and painful, and rolls under the finger. The pain is most intense in the course of the inflamed and obstructed vessels. Sometimes the track of the vein is marked by slight redness, but in other cases, the colour of the skin is not affected. When the lower part of the limb is the chief seat of disease, the inflamed and indurated vessels are found in the popliteal space and on the inner side of the leg and heel. The lymphatics, as well as the veins, are sometimes painful, and the inguinal glands are in such cases swollen and tender. The limb becomes of large size from effusion into the cellular tissue, and at the height of the disease, the tension is such as not to admit of pitting on pressure. The constitutional symptoms are severe. The pulse is from 100 to 150, the tongue generally glazed, the stomach irritable, and the patient is distressed by profuse sweating. The debility is very great, and the pain often prevents sleep almost entirely. After a week or ten days, or a longer period, according to the severity of the attack, the disease begins to decline. The pain becomes less acute, the tension of the limb less marked, and the effusion slowly disappears. In other cases, vesication occurs in certain parts, or over the entire limb. Sometimes the inguinal and femoral glands, or the vulva, suppurate; abscesses occur in the cellular tissue, or the knee and ankle-joints inflame and suppurate. Generally the left leg is the limb affected, but in a certain proportion of cases, the disease appears in the right leg as soon as it begins to decline in the left, and in very rare instances a transference occurs to the upper extremities. Even in the most favourable cases, it is some time before the limb or limbs affected become of the natural size, or acquire their usual strength and freedom from tenderness, and it is remarkable that patients having once suffered from this malady are more liable than others to the disease, after subsequent labours. In the worst cases, death may occur suddenly, or as the result of exhaustion during the progress of the disease, and the patient may be worn out by diarrhœa or by the suppurations which occur in the joints or in other parts of the affected limb. When diffuse phlebitis occurs, in combination with phlegmasia dolens, or when metritis or inflammation of the serous membranes of the pleura or peritoneum accompanies it, the course of the disease and its dangers are little different from the other forms of puerperal fever.

As regards the Causes of the disease, it appears, apart from the influences of contagion or infection, to be brought on by early exertion after parturition, by exposure to cold, and by unusually severe after-pains. I believe, however, that contagion and infection play a very important part in the production of the disease. I look on a woman attacked with phlegmasia dolens as having made a fortunate escape from the greater dangers of diffuse phlebitis or puerperal fever. The plug formed in the vein is generally effective in cutting off the affected extremity from the rest of the circulation, and is so far sanative in its influence. Multiparous women appear to be more prone to the disease than primipara.

In the treatment of Phlegmasia Dolens, it is necessary, at the onset of the disease, to apply leeches freely over the course of the inflamed vein. This should be followed by poultices to encourage the bleeding, and warm fomentations, which generally relieve the pain more than cold applications. If necessary, the leeches should be repeated a second or even a third time, but general bloodletting will rarely be required. Some practitioners prefer blisters to leeches, and in the milder cases of the disease, they are frequently efficacious. They should be applied over the seat of pain or the inflamed vessel. The bowels should be relieved by mercurial purgatives, and the administration of mercury so as to affect the mouth is often useful in the beginning of the disorder. Opiates require to be given freely to obtain relief from pain and to procure sleep. They are necessary at the commencement of the disease, when the vein is acutely inflamed and painful; and subsequently, when the tension of the limb from effusion is at its height, or when local suppurations occur. After the first inflammatory invasion, there soon comes a time when the weakness and depression is so great, that there is no place for an antiphlogistic treatment. Patients require strong beef-tea, soup, broths, milk, arrowroot, &c., frequently, according as the stomach will bear them, and a liberal allowance of wine or brandy. Quinine or bark, with or without the chlorate of potash or the mineral acids, should at the same time be given. Much care is required in the local management of the painful parts of the limb. The whole extremity should be defended by a cradle from the touch of the bedclothes. Sometimes the greatest comfort is derived from wrapping the whole limb in a linseed poultice. When the local pain is intense, great relief is afforded by smearing the extract of belladonna, mixed with a little water, on lint, and putting it on the painful part as a plaster. When the skin is not broken, equal parts of chloroform and olive oil will sometimes allay pain. When vesications occur, poultices, or dredging the limb with flour, should be tried alternately, so as to ascertain which is most suitable to the individual case. Abscesses require to be treated as in other parts of the body. In cases where resolution occurs, the disappearance of the swelling may be favoured by a flannel bandage, the application of an iodine liniment or ointment, or a camphor and mercurial liniment. Frequent frictions of the limb should be persevered in. Change of air, and sea-bathing, if the time of the year suits, tend greatly to aid recovery.

The subjects of Arterial Obstruction and Arteritis, occurring in connexion with childbearing and under other conditions, have only recently been investigated, but they already explain some very curious phenomena which had previously been observed without being understood. The principal contributions to our knowledge of this subject have been made by Dr. Kirkes, Prof. Simpson, Dr. Lever, Dr. Burrows, Dr. R. Virchow, and others. Under a variety of circumstances solid matters may pass into the circulation, and become arrested at various points, according to the size of the morbid material, and the vessels in which it circulates. In cases of rheumatic or other disease of the heart, in which vegetations or excrescences have formed upon the valves, these bodies may be detached from their habitats during the struggles of labour, or in the accelerated circulation incident to gestation, or the puerperal state, or during suckling. Polypi formed in the cavities of the heart may also be propelled into the pulmonary arteries or the aorta. In diseased states of the blood, and in arteritis, or laceration of the arterial coats, it also appears that coagula, or effused lymph, may form impediments in the arterial vessels. In the case of coagula detached from the veins, these bodies may reach the heart by the inferior cava, pass through the right side of the heart, and enter the pulmonary arteries; or pus may enter the general circulation in the same manner in cases of phlebitis, and form the nucleus of obstructing masses.

The symptoms of arterial obstruction vary according to the situation in which the obstruction takes place. When the obstruction occurs in the upper or lower extremities, the symptoms bear some resemblance to those observed in the obstructions of the arteries in aged persons caused by ossification of the vessels. The limb affected becomes pulseless; sometimes, but not invariably, the temperature falls, the limb is perfectly useless and more or less paralysed, and acute or chronic gangrene supervenes. The pain is intense, and neuralgic in character, and the constitutional disturbance great. In one case described by Dr. Oke, of Southampton, the gangrene was limited to the thumb and part of the hand, and the patient recovered. When the obstruction involves the vessels of the neck, or the arteries of the brain, abscesses and softening of the brain, with paralysis, have been observed on dissection. In cases involving the pulmonary artery, abscesses of the lungs, or sudden arrest of the circulation in these organs, have taken place.

As regards Treatment, many of the cases terminate too suddenly to admit of any attempt at remedy. In others, where the head, lungs, or liver are the organs affected, the local disease caused by mechanical obstruction can only be treated on general principles. In some cases, general arteritis has been proved to exist by post-mortem examination, the arterial system generally being implicated to a great extent, and obstructed by coagulable lymph. The symptoms of such cases are only obscurely known, but if the disease could be detected during life, it is probable that the same treatment as that followed in phlebitis would be advisable. When the obstruction falls upon the extremities, the distressing pain should be relieved by opiates, the temperature of the limb preserved by external warmth, and the patient supported by a generous diet and regimen. In a well-marked case under my care at St. Mary's Hospital, the patient very slowly recovered the use of the leg, without the occurrence of gangrene, though this condition was threatened for a considerable time.

The consideration of the causes of Sudden Death occurring in the puerperal state is included in the present chapter, because some of the most marked cases of this kind depend on cardiac, venous, or arterial obstruction, and upon phlebitis and arteritis. In some cases of sudden death in connexion with gestation, childbirth, or lactation, but especially during the puerperal period, the only post-mortem sign has been the presence of firm coagula in the cavities of the heart, as pointed out by Dr. Meigs. Others depend on apoplexy, the result of obstruction of the carotids, or the cerebral vessels. In some cases, obstruction of the pulmonary arteries, which have depended on the transfer of coagula from the veins, have caused sudden dissolution. This was apparently the cause in the case of the lamented Duchess de Nemours, as made out by the careful autopsy performed by Dr. Gueneau de Mussy. The death in these cases generally occurs during some sudden emotion, or upon slight exertion. In the cases of death from coagula formed in the heart itself during life, the coagulation generally appears to have occurred during fainting.

Another cause of sudden death after labour consists in the presence of air in the veins. This subject has been carefully elucidated by the researches of Drs. Cormack and McClintock and others, and appears to explain some of the lamentabl accidents met with after labour. Numerous cases of sudden death are on record in which, upon post-mortem examination, no other cause of death than the presence of air in the hear could be made out. Such cases are also illustrated by thos instances in which death has been caused by the entrance o air into the veins of the neck, during operations on this par of the body. In both classes of cases the symptoms hav been found to be closely identical. The mechanism of thi accident in the puerperal state seems to be as follows. Th occurrence of physometra in the ungravid uterus, and in th uterus after delivery, have frequently been noticed. Afte labour, it may be caused by the secretion of gas from th uterine cavity, or by the decomposition of intra-uterine matters such as coagula or a dead child. If in such cases the ai does not escape from the os uteri, but is shut up in th uterus, the mechanical arrangements of the uterine vein favour the entrance of air into the circulation by this rout and as soon as it reaches the heart the most serious symptom are observable. All the phenomena of sudden asphyxia ar present; but the chief diagnostic mark, according to D

Cormack, is the presence of a "churning" sound in the heart.

To the list of causes of sudden death occurring in the puerperal state must be added Fatty Degeneration of the Heart. I have known several instances in which no other cause of death than a fatty state of the heart could be assigned. In these cases death most commonly occurred after the patient had taken a full meal. In one case, in which Dr. Arthur Farre showed me a preparation of the heart, the substance of the ventricle was, in at least one-half of its thickness, converted into fat, and at some points the muscular element was scarcely perceptible. The arcus senilis was, I believe, observed in this patient during life. Other causes of sudden death, such as Syncope shortly after hæmorrhage, or following upon the assumption of the upright position some time after extensive loss of blood, have already been referred to, and need not be dwelt upon further in this place.

The management of these distressing cases is chiefly limited to the means of prevention, and unfortunately little can be effected even in this manner. When we have said that in cases of valvular or other disease of the heart; or in cases of diffuse phlebitis or phlegmasia dolens — in which at any moment a fatal plug may be detached and pass into the circulation—the utmost quiet of body, and the absence of emotional disturbance, should be preserved, we have pretty well exhausted all that the history of such cases teaches us. In the case of mere syncope every effort should be made by stimuli to prevent the long continuance of this state, so as to avert the formation of coagula in the ventricles. When the presence of air in the veins is known or suspected, diffusible stimuli and the cold douche have been found to be most efficacious modes of procedure. In fatty heart, or other cardiac disease, great care should be taken in guarding the patient against early muscular exertion, and especially against taking indigestive, flatulent, or large quantities of any kind of food, during the first few days after the completion of delivery.

CHAPTER XLIII.

THE INDUCTION OF PREMATURE LABOUR.

Under a variety of circumstances of present or threatened danger, it becomes right and necessary to induce the premature expulsion of the ovum, by artificial means, with a view to the safety of the Mother or the preservation of the Child, or to fulfil both these indications.

Cases in which the operation of inducing Premature Labour may be required, admit of division into three classes :—

I. In which the operation is called for before the date of the viability of the fœtus, in consequence of diseased states of the mother, and in which the ovum has to be sacrificed in order to preserve the life of the Mother from great risk.

II. In which the operation is required after the sixth month of gestation has passed, for the preservation of both Mother and Child.

III. In which it is performed to save the life of the Child, after the date of its viability, under conditions which do not involve any question of danger to the Mother.

As one of the most important principles in obstetrics, it may be stated, that all conditions which render the death of the mother imminent at any period of pregnancy, unless the contents of the uterus are evacuated, call for the performance of this operation. At the present time, the operation under these circumstances has been extended to cases of excessive exhaustion from continued and irrepressible vomiting: to cases of distortion of the pelvis from exostosis, rickets, or mollities ossium, where the deformity is so excessive as to render the birth of a living child impossible. It has been resorted to in cases of ovarian and fibrous tumours within the pelvis, when labour at a later period would hazard inflammation and softening of the tumours. It has been performed in cases of cancer of the uterus. It has been practised in cases of disease of the heart in which urgent and dangerous dyspnœa, or irregularity of the circulation, have supervened. It has been performed in cases of albuminuria with general anasarca, which has refused to yield to treatment, and brought the patient into a state of dangerous anæmia and debility; and in cases of hæmorrhage from the bowels threatening death. It has been employed in chorea arising from pregnancy, and also in mania occurring during gestation; in puerperal convulsions; and it has been resorted to in cases of dropsy of the amnion, when the fluid has increased to such an extent as to seriously interfere with the circulation and respiration of the mother, or when it has excited excessive vomiting. It has been found necessary in cases of irreducible retroversion of the uterus, attended by dangerous symptoms. In any other contingency whatever, besides those named, in which danger exists, and in which the peril is materially increased by the continuance of pregnancy, the induction of premature labour is demanded; but, it should be borne in mind, that it ought not to be performed in any case before the time at which the child becomes viable, unless there is the certainty of present or future danger to the mother from the further continuance of gestation. But in the cases above mentioned, in which the life of the mother is in positive danger, or will be placed in inevitable danger, by the continuance of pregnancy up to the time at which the child becomes viable, it is held right to sacrifice the fœtus by inducing premature labour, and, as a necessary converse, wrong to neglect the performance of this operation. Many of the cases of the Cæsarian operation in which the lives of the mothers have been sacrificed, have been cases in which abortion or premature labour might have been readily induced, and the hazard of almost certain death avoided.

Some have maintained that a certain limit should be placed to the number of times in which the operation for the induction of premature labour should be performed in the same woman, in cases where pelvic deformity exists to such an extent as to render the birth of a living child *per vias naturales* impossible. It has been affirmed that women have no right to go on placing themselves in the position to require the sacrifice of many living children in succession, but that they ought rather themselves to submit to the Cæsarian section. Denman had scruples on this point, and in the present day Dr. Radford has distinguished himself for his advocacy of what is called the right of the fœtus, as opposed to that of the mother, in such cases. My own strong impression—I may say conviction—is, however, that we must deal with the woman pregnant for the twentieth time as we would in her first pregnancy, and that in all cases our clear and paramount duty is to save the woman. No doubt every right-minded professional man would urge upon such women the propriety of living apart from their husbands, or of not marrying at all; but when pregnancy actually exists, considering that the mother is the life-giver; and that in the case of the married woman pregnancy may be forced upon her by her husband; remembering, too, the positive interests of the mother, as compared with the uncertain life of the unborn fœtus; and having in view the enormous danger to the mother from the Cæsarian section, and the large proportion even of children lost by this operation,—I am of opinion that the mind of the accoucheur should never hesitate between the induction of premature labour and the Cæsarian section, whenever the former operation is practicable, and that the question of whether the patient is primiparous or multiparous should not at all enter into his consideration.

In the First Class of cases, the operation is performed because the mother has passed or is passing into a state of imminent danger from some irritation or exhaustion incident to pregnancy. The ovum is, of course, sacrificed. The most important condition calling for this operation is the irrepressible vomiting which, in some patients, begins at the commencement of pregnancy, and increases in intensity and danger as the gestation proceeds. Some of the worst cases of this kind are those in which the liquor amnii is in excess. Cases of retroversion sometimes also require interference in the early months. As regards excessive vomiting, the common tendency is to believe that women will bear almost any amount of starvation, and many women are lost for want of early induction of abortion. No deaths are so distressing to the accoucheur as those occurring from the vomiting of pregnancy, because they might always, by foresight and prompt interference, be prevented. I write feelingly on this subject, as I had the great unhappiness in the year 1857, to be concerned in two cases, in both of which, contrary to my urgent advice, the induction of abortion was delayed with fatal results. In the first case, one of obstinate vomiting—that of a lady who was seen by some of the most distinguished obstetricians of this metropolis—the operation was deferred till the patient was dying of starvation, and though the fœtus was ultimately expelled with little pain, and without any loss of blood whatever, she became insensible immediately after its expulsion, and died in a few hours. In the second case, which was one of excessive vomiting, combined with retroversion, the patient died with the ovum still *in utero*, no attempt at inducing abortion having been made.

It is an important element, in reference to the operation of inducing premature labour, to decide the age at which a fœtus becomes Viable, or in a condition to live after its expulsion from the uterus. The fœtus is not viable—that is, it cannot maintain an independent existence—until towards the end of the seventh month; and any circumstances calling for the induction of premature labour before this time must necessarily involve great risk of sacrificing the life of the ovum. Cases occur in which children, born at an earlier time than this, survive; but these are rare exceptions. Even at the seventh month they are kept alive with difficulty. The state of the heart, as regards development, the feebleness with which the fœtus sucks before this time, the ready failure of animal heat, and the inability to bear the movements necessary to cleansing and nursing, render it almost impossible to rear the fœtus born at an earlier period.

In the Second Class of cases, the induction of premature labour is called for some time between the seventh month and the end of gestation, and the operation is performed with a view to the safety of both mother and child. The chief condition under which this occurs is such an amount of pelvic distortion as would admit of the passage of a child at the end of the seventh or eighth month, but which at the full term would call for craniotomy, or, if labour were allowed to go on without assistance, would endanger the life of the mother as well as the child. Some of the morbid states already referred to, as calling, in certain cases, for delivery before the end of the seventh month, may not in others reach a dangerous extent until after the time when the child becomes viable. This is particularly the case with respect to mania, chorea, fibrous, and ovarian tumours, disease of the heart and lungs, albuminuria, convulsions, dropsy of the amnion, hæmorrhages, and other causes of dangerous debility, which may admit of waiting until after the date of the viability of the child, but if allowed to proceed after that time would place the woman in great danger in labour at the full term. In this second class of cases, it sometimes happens that either the mother or the child may be in the greatest danger of the two, but generally both parent and offspring are delivered from risk by the induction of artificial delivery.

In the Third Class of cases, the operation is called for entirely on account of the fœtus, under circumstances attended by danger to the ovum, but which involve no unusual risk to the mother. In these cases, of course, the operation should only be resorted to after the commencement of viability to the child, and as late in pregnancy as is compatible with the safety of the fœtus. It is found in practice that some women are delivered at or near the full term many times in succession of still-born children, there being every evidence that the children have died during or shortly before parturition. Such children are frequently thin, and below the average weight of the fœtus at the time of birth, but in other cases they are plump and well formed. In some cases of this kind, the child is born alive, but is so feeble as to survive only a short time. The cause of this state of things depends upon various diseased conditions of the placenta, such as inflammation, fatty degeneration, syphilitic disease, or calcareous deposits. In these circumstances, the changes which naturally take place in the placenta as a deciduous organ seem to occur more early, and to a greater extent than is natural. As necessary consequences, the nutrition and respiration of the fœtus is interfered with, and the child either dies *in utero*, or survives its birth but a short time. In other cases, the connexion between the uterus and the placenta is so slight, that the first pains of labour separate the two organs, and hæmorrhage during labour, with the speedy death of the fœtus, ensues. Th remedy for such conditions is the induction of prematur labour, at a time prior to that at which the death of the fœtus has usually occurred. Frequently, the mother is aware, by the gradual diminution of the movement of the fœtus, or by the occasional occurrence of convulsive movements, of th approaching death of the child. The diagnosis of such cases is greatly aided by auscultation. The heart of the child either exceeds or falls below the normal standard of frequency in the latter part of pregnancy, the natural range being from 120 to 140, and auscultation should be resorted to daily in such cases to ascertain the condition of the fœtal circulation When premature delivery is effected, the child is born aliv and survives in many cases, in which its preservation could b effected in no other manner. The intra-uterine marasmu dependent upon disease of the placenta generally commence at the latter part of pregnancy. In cases in which childre are still-born, without any difficulties connected with th labour itself, the placenta and membranes ought carefull to be examined, as affording data for treatment in subsequent pregnancies, and for the performance of this operation. The placenta will in these cases frequently be found the subject of fatty degeneration, or the results of inflammation, or the decidual surface will be studded with calcareous matter.

Many methods of inducing premature labour have been practised. The earliest plan adopted—that which followed the great consultation of accoucheurs, in 1756, about a century ago—was that of puncturing the membranes with a quill, sharpened at the point. Afterwards, a stilette, or a stiletted catheter, was used. The objections to this form of operation are, that by the evacuation of the waters at the commencement of labour, the chances of saving the fœtus are considerably diminished. It is also dangerous to perform it in the early months of pregnancy, particularly in primipara, owing to the undeveloped state of the os and cervix uteri, and fatal results have followed its adoption, even when performed in this way, in the latter months. The dilatation of the os uteri by tents; the separation of the membranes from the os and cervix uteri by a catheter, a large bougie, or the uterine sound; the administration of the ergot of rye—a plan preferred by Dr. Ramsbotham; the use of electricity; the application of cupping-glasses to the mammæ, as practised by Scanzoni; the distension of the vagina by a caoutchouc bag filled with air or water, as recommended by Prof. C. Braun of Vienna, and by other means. But in all these applications, a considerable time often elapses before effective uterine contractions can be excited, and in some cases the uterus refuses to obey the calls of such stimuli. I have little doubt the induction of premature labour might readily be effected by means of galvanism, and I have excited the premature expulsion of the contents of the uterus of the rabbit and guinea pig by this means, as a matter of experiment.

A method superior to all others, where the safety of the child especially is an object, is that of the water-douche, said to have been long practised in Holland, but introduced in a systematic manner into practice, and methodized, by the late Prof. Kiwisch, of Wurzburgh, a man of rare obstetric genius. If a stream of hot or cold water be directed against, or, still better, within the os uteri, at intervals of three or four hours, for the space of ten minutes or a quarter of an hour at each application, labour is certainly and speedily brought on. The water may be made, by means of a syphon and reservoir, to descend upon the uterus from a height, or it may be passed into the os uteri by a common injecting apparatus, or an O'Beirne's tube. Kiwisch explained the *modus operandi* of the douche on the supposition that it caused swelling of the parts by the imbibition of fluid, and separation of the decidua from the uterus. No doubt the reflex and peristaltic actions of the uterus are also excited, and I have found the douche more efficacious when warm and cold water have been injected alternately, than when either warm or cold has been applied alone. The great superiority of this method consists in the fact that premature expulsion, excited through its means, is a closer resemblance to natural labour than can be obtained in any other mode. There is no risk of any injury to the os uteri, and the membranes remain unruptured, during the stage of dilatation, just as in ordinary labour. Hence it happens that the os uteri is dilated by the influence of fluid pressure, and the fœtus escapes compression in the early part of labour. These circumstances are attended by such obvious advantages, that in my opinion no one would be justified in puncturing the membranes in a case in which labour was brought on to save the mother and the child, or in circumstances where the child alone was in danger. The membranes certainly cannot be ruptured as a preliminary to the induction of labour without diminishing the chances of saving the child. The use of the douche certainly possesses great advantages in all cases in which the safety of the child is an object. In cases where there is no possibility of giving birth to a viable child, the stiletted catheter or other means may be resorted to, but even then the douche promises the greatest safety to the mother, except under certain circumstances presently to be mentioned. One great advantage of the douche is, by its use premature labour may be induced in cases of deformed pelvis in which it is impossible to reach the os uteri with the finger.

The length of time which may intervene between the commencement of the operation and the completion of abortion or labour, is an important element in estimating the utility of the different methods. This is particularly the case in conditions in which, for the safety of the child or the mother, it is important that the uterus should be emptied as quickly as possible, as, for instance, in cases in which the fœtal heart is failing, or in which the mother is in great danger, as in puerperal convulsions. Under such conditions the administration of ergot, the puncture of the membranes, and other modes requiring considerable time for their action, are out of the question. We may frequently, by the use of the douche, complete the labour at one sitting, if we throw the fluid into the uterine cavity. Dr. Braun says that the same may be accomplished by distending the vagina by the fluid pessary pressure, and he therefore strongly recommends it in cases of puerperal convulsions, in which the os uteri has not opened, or is opening slowly. I can vouch for the expeditious operation of the douche, as I have now in many instances induced labour by a single use of the injecting apparatus. In my last case of this kind, which occurred in February, 1858, I met Dr. Kershaw, of Kingston-on-Thames, and labour was safely concluded in five hours from the commencement of the operation. The case was one in which a lady had previously borne dead children, and the instrument used was a Kennedy's syringe, to which a flexible tube ten or twelve inches long had been affixed. We passed the tube nearly its whole length into the uterus, and injected continuously about a gallon of warm water. The patient was about a month from the full time of gestation. She was quite well and free from pain, the os uteri being perfectly undilated, when the douche was used at eight o'clock in the evening, labour commenced immediately afterwards, and she was delivered of a living child at one o'clock on the following morning.

It remains to say a few words as to the Time at which the operation has to be performed, and as to the methods of operating to be preferred in the earlier and later stages of gestation. When the premature expulsion of the ovum is requisite in the middle months of pregnancy, or at any time between the fourth and seventh month, purely with reference to the preservation of the mother, the use of the douche is safe and practicable. In the early months, while the cervix uteri is as yet undeveloped, and the ovum is contained in the cavity of the fundus uteri, the douche cannot be relied on. I have been consulted in more than one case of marasmus from excessive vomiting during early pregnancy, in which death occurred before the douche could be brought to bear. In similar cases, the plan I have adopted is, to introduce the uterine sound into the uterus, and turn it round once or twice, an operation which, according to my experience, rarely fails to induce the expulsion of the ovum; and is, I believe, attended by little risk, when carefully performed. After the third or fourth month, and before the end of the seventh, the membranes may be punctured with the stiletted catheter. At this time there is no expectation of saving the child, and the size of the head is not such as to render the retention of the liquor amnii of any consequence. Before the fourth or fifth month it is dangerous to use this instrument. In cases of danger to the mother, the drawing off of the liquor amnii affords considerable relief even before the expulsion of the ovum. This procedure is especially adapted to cases of dropsy of the amnion. It is easy of performance within the periods named unless anteversion or retroversion exist, when it becomes difficult or almost impossible.

For a considerable time, the operation was not considered justifiable in primiparous women. It was considered that at least the experience of one labour was necessary in order to judge of the propriety of inducing premature labour in any given case. At present, however, if a woman pregnant for the first time passes from any cause into imminent peril of death, and this peril is increased or caused by the existence of pregnancy, it is considered perfectly justifiable to obtain the expulsion of the contents of the uterus. Again, if a woman in her first pregnancy is found to be so deformed as to render the birth of a living child impossible, it is held to be quite right to induce premature labour in the early or middle months of pregnancy, and not to wait for the danger of her first delivery, and the performance of craniotomy. In cases of doubtful capacity of the pelvis, or when the state of the pelvis has not been ascertained before the time of the first labour, but in which craniotomy has been necessary, or in which children have been still-born and the mother placed in danger, from decided disproportion between the head and the pelvis, the practitioner should always insist upon the necessity of inducing premature labour in future pregnancies. In this way the lives of multitudes of children, and of many mothers, might doubtless be saved. A great responsibility is incurred by allowing women with moderate contraction of the pelvis to go on to the full time in successive pregnancies, and thus to sacrifice successive children. It is probable that the practice of the induction of premature labour will be extended from a greater knowledge or increasing appreciation of its importance, and also from a real increase in the cases calling for it. Amongst the manufacturing population deformities of the pelvis are probably on the increase, and amongst the educated classes the size of the fœtal head, and delicacy of constitution will form impediments to labour at the full term in an increased number of cases. It is amongst the educated classes that the greatest number of still births occur, and the greatest danger to both mother and child are met with. At the present day, there is no point of progress in the obstetric art of equal importance with the extension of the induction of abortion and premature labour, in cases calling for the operation.

The extension of the induction of premature labour in cases where mothers have, in successive births, produced still-born children, is in fact the great means to which we must look for the diminution of the mortality amongst children at birth. Every man engaged in the special or general practice of midwifery, must have met with cases in which healthy well-formed women have produced a considerable number of still-born children in successive births, or in which, out of large families, only one or two have survived the birth. It is to such cases that the induction of premature labour is peculiarly applicable, and in which it is at the present time but little practised. In cases of this kind, the chances of saving the child may be immensely increased by the operation, without risk to the mother. A vast amount of prejudice has, however, to be got over, before this subject will be placed on its proper footing. I saw, a year or two ago, a case with Dr. Trouncer, in which premature labour was brought on after the mother had given birth to several dead children in succession; on this occasion a live child was born, but in the next pregnancy the patient declined the operation, and another still-birth occurred. Similar instances must constantly happen. In a matter of this kind, it is only slowly that a great improvement can be carried out. It is computed, in a letter by Dr. Farr, to the Registrar-general, on the Causes of Death in England in 1854, that the proportion of still-born to live-born children is about 3 dead to every 100 born living. The total number of births in England and Wales in 1852 was computed to be 646,134. Of these, 624,012 were born alive, and 22,122 were estimated to have been still-born. In France, in the same year, the number of children still-born, or dying before the registration of birth, was 68,267. This is an immense number of children, the great proportion of whom are lost during, or immediately before, the act of parturition. There can be no doubt that the number might be greatly diminished by the extension of the practice of the induction of premature delivery in proper cases. Carrying the mind from England and France, to the other countries of the civilized world, the mass of infant life, to the saving of which obstetric science must address itself by these and other means, is enormous in amount. Every man must regret the necessity which sometimes occurs for sacrificing the ovum before it has become viable; but no operation can be performed with greater pleasure than that which rescues the infant, or both the mother and the infant, from the imminent risk of death.

CHAPTER XLIV.

TURNING.

The operation of Turning is called for under a variety of circumstances, some of which arise out of the nature of the presentation or the state of the fœtus, and others depend on the condition of the mother. In some cases the operation is performed with a view to the safety of the mother alone: in others, it is the safety of the child which chiefly calls for the operation; and in a third class of cases it is resorted to both on account of the mother and the child. It is necessary to consider the several conditions calling for the operation, as the method of executing it varies considerably, according to the state of the mother and the child. There are two chief kinds of turning or version,—one termed Podalic Version, in which the feet or a single foot has to be brought down; the other Cephalic Version, in which the head is brought into the pelvis, some other part having presented previously. But this latter is only practicable or attempted in rare cases; and by turning, the operation of bringing down the feet, or a foot, is understood. In some cases, what is termed Pelvic Version is recommended, in which the case is converted into a breech presentation. Cephalic and Pelvic Version will be adverted to hereafter.

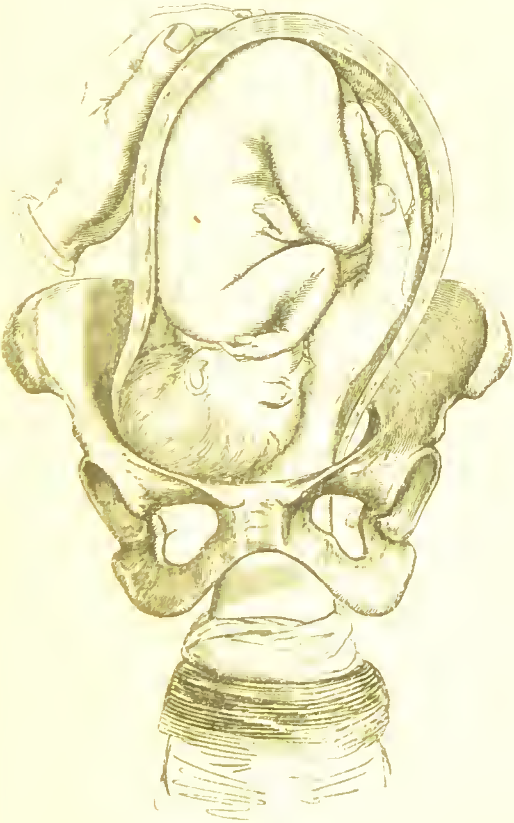
Ordinary Turning, or Podalic Version, is required in cases of hand, arm, or shoulder presentation, when, except in the rare occurrence of spontaneous evolution, labour can never be allowed to proceed without great danger to the mother and child. It is also sometimes resorted to in prolapsus of the umbilical cord. It is called for in cases of placenta prævia, as offering a much better chance of life to the child than the detachment and removal of the placenta, and, except in extreme cases, being quite as safe for the mother. It has to be resorted to in a considerable number of circumstances in which the patient is in danger from the continuance of labour, but in which craniotomy cannot or ought not to be performed; such as hæmorrhage occurring during the course of labour, and irrepressible by rupture of the membranes or by other means; convulsions; rupture of the uterus and escape of the child into the abdomen; excessive debility; fainting; and dangerous vomiting during labour. The balance of evidence would also appear to be in favour of the performance of this operation in some cases of moderately-contracted pelvis, in which craniotomy would be required in head presentation. But the application of turning to such conditions is one of the agitated questions of the present day, which requires the sober and dispassionate consideration of all who are interested in the establishment and advance of obstetrics. In some cases of twins, in which the second child presents with the head, but where no progress is made, and where the head is too high to admit of the application of the forceps, turning becomes necessary and proper. Turning has been also recommended in cases where the mother has died during labour; but the mortality of children after turning, in such cases, is much greater than when the Cæsarian section is resorted to.

Turning is a serious operation, not only with reference to the contingencies in which it is required, and as regards the direct consequences of the procedure to the mother and child. Some of the conditions in which it is called for, as convulsions, rupture of the uterus, and placenta prævia, are themselves highly dangerous. In the performance of the operation also, uterine inflammation may be excited, the uterus may be ruptured or perforated, and the mere shock of the operation is fatal in some cases. The danger to the child arises chiefly from the compression of the funis during the passage of the thorax and head, and the extension of the neck in passing through the pelvis or the ostium vaginæ. According to the statistical researches of Dr. Fleetwood Churchill, in 419 cases in which the result to the mother was noted, 29 deaths occurred, or 1 in $14\frac{1}{2}$; in 792 cases in which the result to the child is stated, 294 children were born dead, or rather more than 1 in 3. This mortality, especially as regards the mother, must, however, be divided between the operation itself, and the dangerous contingencies in which it is sometimes required.

The Hand to be used by the operator in turning is a matter worthy of consideration. Two things weigh here: first, the hand which most easily adapts itself to the different conditions in which turning is required; and secondly, the hand with which the operator possesses most skill and power of manipulation. It is best, as far as possible, to accustom ourselves to the use of both hands in obstetric practice, so as to acquire a readiness in the use of the left hand, as well as the right; but for persons who are awkward or unpractised with the left hand, the greater mechanical facilities which exist for its introduction, in some cases, will not at all compensate for the greater power and freedom possessed by the right hand and arm. One thing should be especially borne in mind—namely, to use, if possible, at the commencement that hand with which we shall be able to complete the operation, so as not to fall upon the course of being obliged to withdraw one hand in order to substitute the other, after the operation has been in part performed.

In placenta prævia, the hand to be introduced should depend in part upon the situation of the separation of the placenta from the os and cervix uteri, or, in cases of partial placental presentation, upon the portion of the os and cervix uteri to which the placenta is attached. When the placenta is separated from the anterior or left border of the os and cervix uteri, or when it is attached only to the posterior or right margin of the uterine aperture, the right hand is most convenient. When the opposite state of things is met with—that is, when the placenta is detached or wanting, posteriorly, or on the right side of the os and cervix, the left hand is most readily introduced into the uterine cavity. A chief object, in such cases, is to pass the hand through the os with as little detachment of the placenta as possible. When the operation is called for by some condition of the mother, and the head presents, the mechanical facilities of passing the hand and reaching the feet are modified by the situation of the vertex. It is easier to pass the hand over the face than the vertex, and the feet of the child are usually found on the same side as the face. Thus, in the first and fourth positions, the left, and in the second and third positions, the right hand would be most convenient. When the head is known to present, but the special presentation cannot be made out, it must be taken for granted that the head presents in the first position, that presentation occurring in from 70 to 80 per cent. of all head presentations. But when the head is so high as not to be reached for diagnosis, it matters comparatively little which hand may be used. In turning in presentations of the upper extremity, the hand to be used should depend on the circumstance of whether the anterior part of the child be towards the abdomen or the spine of the mother. In the first position, in arm cases, when the abdomen of the child is towards the spine of the mother, the left hand is most convenient. In the

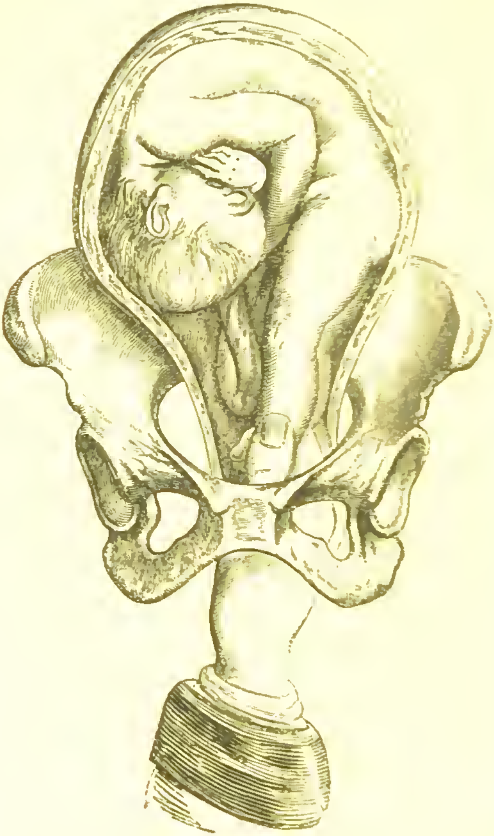
FIG. 160.



Introduction of the hand into the uterus, so as to grasp the feet of the child in vertex presentation.

second position, in arm cases, when the abdomen of the child is towards the abdomen of the mother, the right hand of

FIG. 161.



Withdrawal of the hand, and the act of bringing down the foot, in vertex presentation.

the accoucheur should be employed. Turning, when the right hand can be most readily employed—that is, when the abdomen of the child and the extremities are directed towards the abdomen of the mother, is more easy than when the fœtal abdomen is turned towards the spine, on account of the greater depth of the pelvis posteriorly as compared with the anterior, and the less distance the hand has to traverse to reach the uterus in front. In all cases of doubt, therefore, or when the facilities of passing the hand in any direction are equal, the right should be preferred, both on account of the greater ease with which it reaches the uterus, and the greater skill in manipulation possessed by almost all persons with the right hand.

As a preliminary to Turning, and to all operations within the pelvis, the bladder and the bowels should be emptied. The position of the patient varies in different schools and with different teachers. In France and America, many of the best authorities prefer to have the woman placed on her back. In this country, the ordinary obstetric position on the left side is generally preferred; but the nates are brought to the edge of the bed, and the body of the patient placed at right angles with it. The accoucheur should not only bare his arm, but take off his coat, to avoid the effect of pressure on the muscles, and having introduced some lard into the vagina, and well greased the wrist and the back of the hand which it is intended to use, the operation may be commenced. The first difficulty is at the ostium vaginæ, and the introduction of the hand into the passage is often the most painful part of the whole process. The fingers and thumb should be put together in a conoidal shape, and gently introduced during a recession between the pains, in the direction of the axis of the outlet of the pelvis. When the thickest part of the hand is passing the sphincter vaginæ, the patient, if sensible, generally cries out, and this cry facilitates the passing of the hand by relaxing the sphincter. When the hand is fairly in the vagina, and the os externum embraces the wrist, there is usually little suffering; and, at this stage of the procedure, a short pause is advisable, during which, if the head or presenting part be not very low down, the accoucheur may make a more complete examination than he could accomplish with the finger alone, and decide as to the direction in which the hand should be carried forward through the pelvis. When the arm or a shoulder presents, there is a difficulty in introducing the hand into the vagina, not only from the state of the os externum, but from the shortness of the unoccupied portion of the canal, and it requires some management to pass the hand into the vagina in such a manner as to retain the fingers in a position admitting of effective manipulation at the os uteri. While one hand is passing through the os uteri, the other should be laid upon the abdomen, so as to steady the uterus, and prevent its being pushed upwards. Cases have occurred in which the posterior wall has been lacerated, or the posterior lips of the os separated from the vagina, by awkward and forcible attempts without this precaution. The direction of the hand should, on entering the os uteri, be altered so as to follow as nearly as possible the axis of the middle strait, and subsequently of the inlet, of the pelvis.

The further steps of the operation must greatly depend on the state of the os uteri. When the os is fully dilated, and the membranes unruptured, turning is easily effected. The hand should be passed into the uterus between the membranes and the uterine parietes, the palm of the hand being directed towards the abdomen of the fœtus. No attempts at pushing the hand forward are to be made during the presence of a pain; but if the pains come on at the time of the passage of the hand, it is to be held perfectly still, and slightly hollowed, so as to adapt itself to the walls of the uterus. Care must, however, be taken not to exert pressure upon the umbilical cord, and particularly upon its insertion into the abdomen, by the hand. This point should be defended, and at the same time as little pressure as possible exerted upon the uterine parietes. With the os uteri dilated, the waters undischarged, and the uterus in that comparatively quiescent state which obtains before the commencement of the expulsive stage, the whole operation up to this point is comparatively easy, and need not occupy more than a few minutes. The membranes have now to be ruptured by scratching them with the finger-nails; but little water is discharged owing to the engagement of the os uteri by the wrist or arm. Sometimes, the knee or foot of the fœtus can be felt through the membranes before their rupture, at others, these parts are best made out after the hand of the accoucheur has passed into the membranes. If we could choose the time at which turning should be performed, we should select the moment at which the os uteri had fully dilated, but the membranes had been unruptured: or we should seek the time at which the membranes had broken, but before the violent contractions of the second stage of labour had commenced. Most frequently, however, we have no choice in the matter, but are obliged to act after the membranes have been ruptured, and the uterus has contracted more or less firmly upon the fœtus.

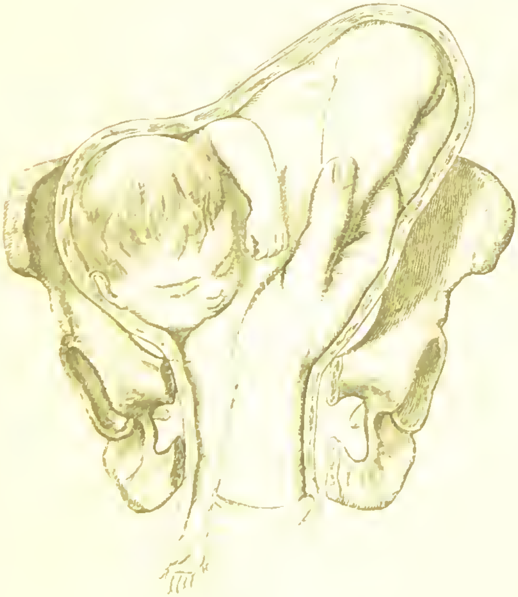
When the os uteri is only partially dilated, the passage of the hand into the uterus is a more difficult procedure. It is held that when the os is dilated to the extent of a crown-piece, or two or three fingers can be introduced, either with or without the rupture of the membranes, the hand may, with care, be passed in, so as to turn. The os must be very gently and slowly dilated by separating the fingers, and urging them on in the cone shape used in passing the ostium vaginæ, the pressure being exerted in the direction of the inlet of the pelvis. Care must be taken to support the uterus externally, and not to push the uterus upwards to such an extent as to separate it from the vagina. When the os has been fairly passed by, the hand, the anterior surface of the fœtus must be reached in the way already described.

Among the most difficult cases of turning are those of transverse presentation in which the diagnosis has not been made out early in labour, or in which the case, from some circumstance or other, has gone on for a long time unrelieved. Here, the arm or shoulder is found low down in the pelvis, occupying the vagina; the presenting part is firmly embraced or grasped by the os uteri; the waters have long flowed away; the uterus has closed with great energy upon the fœtus, and is reduced to the smallest possible compass consistent with the retention of the placenta and the non-presenting portions of the fœtus. Thus every step of the operation becomes perplexing. It is difficult to introduce the hand into the vagina, and still more so to pass the hand, or part of the hand, into the uterus and raise the presenting parts of the child. It is only by slow degrees that the difficulties can be surmounted so far as to allow the lower extremities of the child to be reached. There are, however, some circumstances which, to a certain extent, counterbalance these unfavourable conditions. In transverse cases, the shape of the uterus is considerably modified. Its greatest diameter is the transverse instead of the perpendicular, and consequently the lower extremities of the child are much nearer the os uteri than in vertex cases, or in arm cases where the waters have not escaped. It is often therefore unnecessary, and indeed impossible, to pass the hand far into the uterus, and frequently a foot or arm can be brought down by the introduction of one or two fingers only within the os uteri, the bulk of the hand remaining in the vagina. In this way it is sometimes possible to turn with only two or three fingers in the uterus. This is a great advantage, as the introduction of the whole hand under such circumstances increases the risk of lacerating or bruising the uterus, or of causing the organ to rend itself by the violence of its own contractions.

Formerly, the dilatation of the os uteri in cases of constriction, or the relaxation of uterine spasm in cases where the waters had been long expelled, and the pain produced by the operation, were difficult and anxious matters. Bleeding to syncope, the hot bath, emetic tartar, and opiates, were relied on for these purposes. Chloroform is, however, far preferable to any of these means, unless, indeed, bleeding should be required by some constitutional condition of the patient. The inhalation of chloroform relaxes the contraction of the os uteri, the ostium vaginæ, and the body of the uterus, in addition to the immunity from pain which it produces. We are often able to deliver by turning, under chloroform, in cases of arm presentation, where it would have been impossible to have turned without its use.

The mode of seizing the fœtus, and completing the process of version, varies somewhat in the different circumstances in which turning is required. When we turn to save the mother from imminent danger, the operation should be performed as quickly as possible, due regard being had to the fact that a too rapid extraction of the child increases the shock of the operation. Under these circumstances, the two feet of the child should, if possible, be brought down, and gentle traction should be exerted, particularly during the pains, until delivery is effected in the manner described when speaking of footling presentations. When the waters are retained, it is astonishing what a small amount of traction will effect the version of the child. Simply holding one foot, or both feet, in the lower part of the uterus, while the organ is exerting its moulding and contractile efforts upon the rest of the child, will often be sufficient to cause the head or shoulder to rise, and the feet to descend. Holding on, upon the feet or foot, is all that should be attempted during the pains. Any traction that may be required should be exerted while the uterus remains passive, until the foot or feet descend through the os uteri. When the object in turning is not the dangerous state of the mother, but the condition of the child, the operation should be performed as leisurely as possible until pressure comes to be exerted on the umbilical cord. With this view, one foot, rather than two, should be brought down. We have seen that in cases where the breech presents, the mortality is 1 in 3½, while in cases in which the feet present, the mortality is 1 in 2½. In bringing down one foot, we assimilate the case to breech presentation. In a case in which one foot is brought down, and the other extremity remains flexed upon the abdomen, the circumference of the presenting part is from 11 to 12½ inches; when both feet come down, the circumference of the breech is from 10 to 11¼ inches. It is therefore safer to bring down one foot in turning when the operation is performed with reference to the fœtus, as the greater dilatation of the soft parts by the pelvic portion of the child favours the descent of the head and the defence of the umbilical cord from pressure. When it can be reached before the foot, there

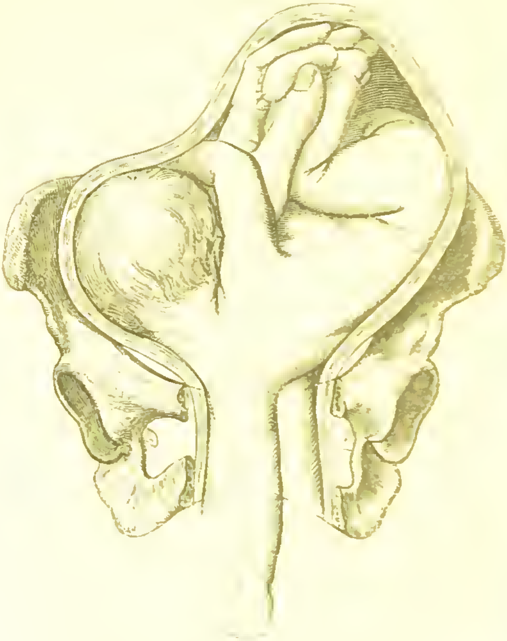
FIG. 162.



Turning in transverse presentation, in the abdomino-anterior position, with the right hand.

is an advantage in bringing down the knee, as the axis of the trunk and thigh is less than the axis of the trunk and the whole extremities of the child.

FIG. 163.



Turning in transverse presentation, in the abdomino-posterior position, with the left hand.

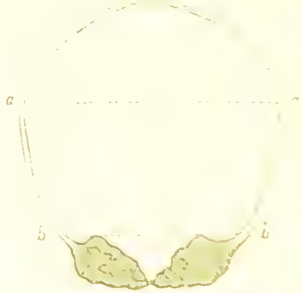
In arm presentations, the knee or foot of the side opposite to the extremity presenting should, if possible, be brought down, as, when this is the case, version is more easily performed than when the foot or knee of the same side is grasped. To effect this, the hand of the accoucheur should be passed up along the inner side of the arm presenting, which will guide it to the anterior surface of the child. If the foot is below the knee, it should be brought down. The rules for distinguishing between the foot and hand, or knee and elbow, have already been dwelt on, when the various presentations of these parts were under consideration. In the case of turning on account of pelvic deformity, the object being to bring the head through the pelvis as quickly as is consistent with the safety of the child, both feet should be brought down if possible. When one foot is perceived, and can be brought through the os externum, a tape or handkerchief should be put round it to enable the accoucheur to hold it more securely. The foot is slippery, particularly if the child is covered with caseous matter, and the fœtus has a tendency to be drawn upwards on the subsidence of every pain. In delivery, the same treatment is to be adopted as that directed in knee or footling cases, only that greater or less expedition in effecting delivery must be followed according to the special exigencies of the child or the mother. The Forceps ought always to be in readiness to complete, if necessary, the delivery of the head. After all cases of turning, the patient should be carefully watched, with a view to the prevention of local inflammation.

In some rare instances of transverse presentation, it is possible to raise the arm or shoulder and bring down the head, thus effecting what is called Cephalic Version. In this operation we have to retrace the steps by which the presentation of the head is converted into transverse presentations. The head of the child has to be manipulated by the hand engaged in utero, assisted by the other hand applied externally, so as to bring it to the pelvic brim, with the vertex directed towards one of the sacro-iliac articulations. After this, the case is left to Nature. Cephalic version is very much aided by external manipulation, particularly when the uterus and abdominal walls are sufficiently thin to allow of the different parts of the fœtus being readily felt. Cases are recorded, by Martin of Jena and others, in which rectification and alteration of mal-presentations have been effected by external manipulation alone. In Pelvic Version, the nates are brought down, but this is a very difficult procedure on account of the lubricity of the parts; and it is not of very much greater value, when effected, than Podalic Version, when one foot only is brought down.

I have already referred to the question of the performance of Turning, in the place of Craniotomy, in cases of contracted pelvis; and the subject is of so much importance that I shall endeavour to give as succinctly as possible an outline of Prof. Simpson's theory and practice upon this point. It should be premised, that seventy or eighty years ago, turning in cases of deformed pelvis was a recognised practice, and is treated of at considerable length by Denman and other writers of that period; so that Dr. Simpson's proposal to turn in the present day is a revival of a practice which had fallen into disuse, rather than an innovation. Numerous cases of deformed pelvis are on record in which turning has been practised from choice, or in which the feet or nates have presented, and delivery has been accomplished without material injury to the mother; and these cases naturally suggested the establishment of the operation as a rule of practice under certain conditions.

The following points in the anatomy of the fœtal head with reference to difficult parturition, and the operation of turning, are strongly insisted upon by Dr. Simpson. The bi-parietal diameter exceeds the bi-mastoid diameter by from half an inch to three-quarters of an inch. (Fig. 164.) In delivery by turning, the bi-mastoid, and, in vertex cases the bi-parietal diameter first engages in the pelvis. The great question is, can the fœtal head, under all the circumstances of pelvic deformity, pass through most readily with the bi-parietal, or the bi-mastoid diameter first?

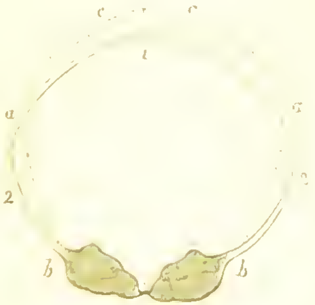
Fig. 164.



Section of fœtal skull. *a, a.* Bi-parietal. *b, b,* Bi-mastoid diameter.

The bi-mastoid diameter is comparatively incompressible, in order to defend the medulla oblongata, the *nodus vitalis* of fœtal as well as of adult life: but the bi-parietal diameter may be compressed to a great extent without destroying the fœtus. In children born alive, it has been found considerably flattened, indented, or even fractured, in cases of deformed pelvis with a diminution of the conjugate diameter. The bi-parietal diameter varies in the natural fœtal cranium from 3½ to 4 inches, but it may be compressed to 2½ or 3 inches, for the short time during which the head may be drawn through the pelvis, without necessarily destroying the child. Denman was of opinion that the living fœtal head would bear a greater amount of compression than this. In delivery by turning, the child is drawn through the pelvic opening; in vertex delivery, it is pushed through from behind; and there are many instances in mechanics, in which bodies can be drawn through openings which no amount of force applied from behind would make them pass. In the case of the fœtal head and the deformed pelvis, Dr. Simpson believes that in vertex labour, when the vertex does not readily enter the pelvis, it is bulged or squeezed out laterally, and the bi-parietal diameter increased, by the pressure of the body of the child under the influence of uterine contraction. This is illustrated by the following diagram. (Fig. 165.)

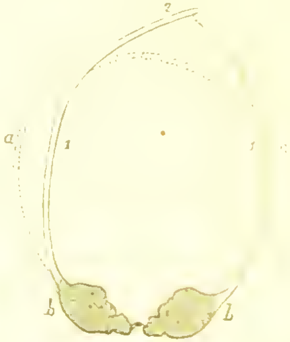
FIG. 165.



Section of fœtal skull. The dotted line, *a a*, *b b*, *c c*, represents the normal outline. 1, 2 2, represents the alteration produced by the compression described.

If the bi-mastoid diameter first comes into the pelvis, a different form of compression occurs. When the vertex descends first, it is the base of the cone formed by the fœtal head which first attempts to pass through. When the bi-mastoid diameter presents at the pelvic brim, it is the apex of the cone represented by a transverse section, which passes first. The tendency of the bi-parietal diameter is to increase in vertex cases, when the vertex does not readily enter the brim; but when the bi-mastoid diameter enters the pelvis first, and is drawn through it by traction applied to the fœtal extremities, the larger or bi-parietal diameter is readily compressed to a considerable extent. This point has already been referred to, and admits of easy demonstration. (Fig. 166.)

FIG. 166.

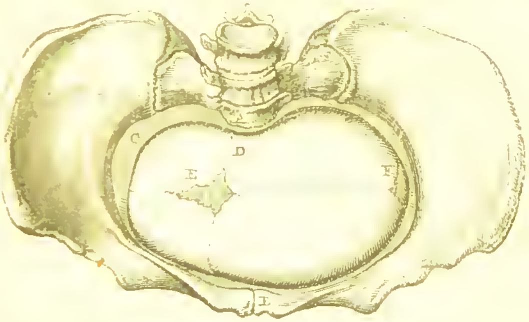


Section of fœtal skull. *a a*, *b b*, normal outline. 1 1, 2, outline of skull, as compressed in turning.

Other mechanical arrangements facilitate the descent of the head face foremost, as compared with the descent of the vertex. The bi-temporal diameter is usually from three to five-eighths of an inch less than the bi-parietal. In vertex presentations the chin of the child is bent upon the sternum: the result is that the vertex and the bi-parietal portion of the head enters the pelvic strait first, and with the bi-parietal or larger diameter opposed to the conjugate diameter. In delivery by turning, the chin is extended, and the bi-temporal diameter descends first and nearer to the conjugate diameter, the bi-parietal being received in the lateral and widest part of the pelvis. The subjoined diagram exhibits the passage of the head through a deformed pelvis in turning. (Fig. 167.)

These are the chief anatomical considerations relative to the proposed mode of practice. Dr. Simpson insists greatly upon the fact that it can be performed early, and is in this respect favourably contrasted with craniotomy, which must be performed late, and after the woman has been subjected to the perils of protracted labour. The patient also escapes the risk of injuries to the vagina and soft parts by instruments. The fœtus, it is well known, is in the state of an amphibious animal, and bears a short interruption to the utero-placental circulation without a necessarily fatal result. The cord may also generally be guarded to some extent by being placed at the sides of the pelvis, in the position affording most room. It is in deformed pelvis with diminished antero-posterior diameter ; or on oblique deformity, that turning promises the greatest chance of safety to the mother and child, and not in the contractions of the transverse diameter. The limits of the deformity within which a living child may pass in turning have yet to be determined. Dr. Fleetwood Churchill puts it at two inches and six-eighths ; but as the limit for the passage by the vertex is three inches and a quarter, a considerable latitude for the operation of turning exists. The objections to the measure are—the injuries which may be done to the mother ; the difficulty of diagnosing the exact amount of deformity ; and of performing craniotomy when turning has been tried, in cases where it is subsequently found that the head cannot be delivered without reduction. As regards the injuries done to the mother, the cases on record and the statistics of the operation certainly do not show them ; and it was the opinion of Denman that craniotomy in such cases was almost as easy as in cervix presentations, so that there is every reason to hope that with the knowledge we now possess of the condition of the fœtus by auscultation, and the advantages afforded by chloroform in such cases, turning will be per-

FIG. 167.



Deformed pelvis and compressed fœtal head. A. Promontory of sacrum. B. Symphysis pubis. C. Space between forehead and ilium. D. Depression in fœtal head. E, F. Anterior and posterior fontanelles.

formed, and a chance of safety afforded to the child, in cases where craniotomy was formerly considered the only resource. It is probable that the practice will hereafter be combined with the induction of premature labour in cases of pelvic deformity, where the conjugate diameter is even below two inches and six-eighths. I have performed the operation of turning in four cases of high distortion, in which craniotomy would have been the only alternative, with the result of saving the child in one case, and in all the mother recovered.

CHAPTER XLV.

THE FORCEPS.

CHAPMAN, who first published to the world an account of the Forceps, calls it "a noble instrument;" and well might he do so, since it has probably saved more lives than any mechanical invention ever discovered. We owe the production of the forceps to Dr. Paul Chamberlen, who, with his three sons, kept the matter a secret for their own benefit during sixty or seventy years. It has now been in use upwards of two centuries, and though all agree as to its incalculable utility, there are some points respecting its formation and application upon which obstetricians are not yet entirely agreed. The first intimation of the discovery of the forceps was made in 1647, by Dr. Peter Chamberlen, who gives the merit of the discovery to his father. Dr. Paul Chamberlen. In 1762, another son, Dr. Hugh Chamberlen, refers to the discovery as one to which his father and brothers had, "by God's blessing, and their own industry, attained to." The invention gradually became known, but it was not until 1733 that Chapman published a description and plate of the instrument. Measureless censure has been heaped upon the Chamberlens for their conduct in keeping the discovery of the forceps a secret. It is a great and noble principle that no invention and discovery in an art like medicine should be withheld from the common good; but in condemning the Chamberlens, we must remember the age and fashion of the time in which they lived, when monopolies in various branches of trade and manufacture were held by the nobility, and even by royalty itself. We have evidence that at least one of the Chamberlens, Dr. Hugh,

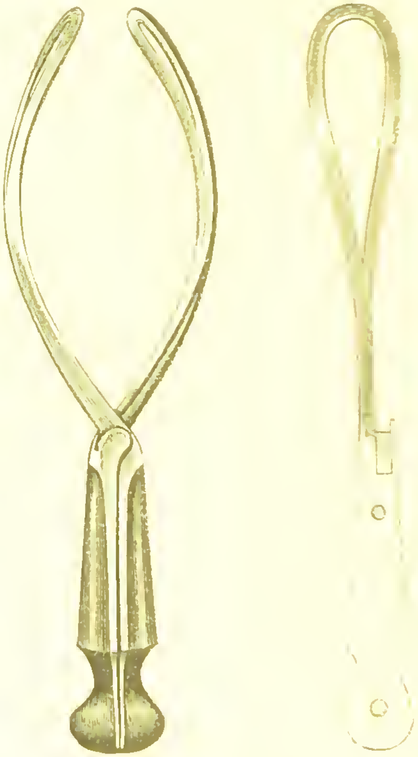
Avicenna & Albucasis describe & the latter gives an illustration of an inst. wh was clearly a Midwifery forceps, & was intended to be used in the extraction of a living child. Dr Alf. Meadows. Lancet May 11-72.

could suffer for conscience' sake, in the fact of his flight into Holland on account of espousing the cause of James II.

The short, straight forceps, termed Denman's forceps, chiefly in use in this country at the present day, is essentially the same instrument as that devised by the Chamberlens. The chief alterations and improvements made in it were the work of Smellie. The most perfect Chamberlen forceps had the handles bent in the form of hooks; for these Smellie substituted handles of wood. As Chamberlen left the joint, it resembled that of the common scissors, but without the pivot, the joint being made secure by a piece of tape or cord passed through a hole in each blade, and wound round them after they were put in apposition. In another specimen of the Chamberlen forceps, one blade is provided with a fixed pivot, to receive upon it the other blade and secure it. This is called in the present day the German lock, and has been improved upon in the instrument called Naegelé's forceps. In lieu of these somewhat clumsy arrangements, Chapman invented the lock now in use.

This forceps, known as the Straight Forceps (Fig. 168), consists of two separate blades, which are introduced separately, and which, by locking, are converted into one instrument. These are called the left hand or male blade, and the right hand or female blade. Each blade consists of a handle, a shank, and the curved portion or clam, which adapts itself to the side of the head of the child. The ordinary straight forceps now described has but this one curve, which may be called the Cranial Curve, as its special relation is to the head of the child. The length of the curved portion of the blade is about eight inches. The curved portion of each clam contains a fenestrum or opening fitted to receive the parietal protuberance, and, when both blades are in apposition, to allow the fœtal head to protrude somewhat through the sides of the instrument. The length of the whole instrument is about twelve inches. The distance between the most curved portions of the clam is about three inches. When the handles are in perfect apposition, the extremities of the two clams are about an inch apart. The length of each fenestrum is about three inches. When the instrument is in action upon the head, the extremities of the handles are about one inch asunder, and not close together as when the instrument is held in the hand. Its whole weight should not exceed twelve ounces. Of course, it is necessary that the steel should be of the finest temper, to resist the force which has to be exerted in some cases of extraction of the head. The edges are bevelled off in every direction, to prevent injury either to the child or the mother. It was formerly the fashion

Fig. 165.



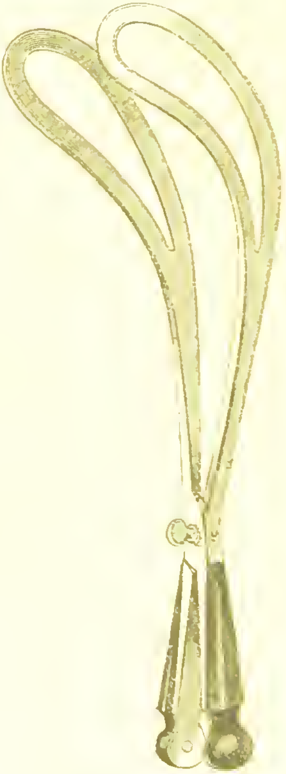
Short straight forceps.

to cover the forceps with wash-leather, this being done with a view to make the appearance of the instrument less martial, and to present a soft surface to the maternal passages and the fœtal head. Some advocate this proceeding at the present day, but the great majority avoid it, on account of the increased bulk and difficulty of passing the blades, and also the risk of carrying the infection of gonorrhœa or syphilis. The infectious principle of contagious fever ought, perhaps, still more to be held in dread. Some instruments are now sold covered with gutta percha, but nothing is so perfectly clean or so easy of introduction as the naked metal, anointed with oil, lard, or glycerine.

This instrument is calculated for the delivery of the head from the lower and also from the middle strait of the pelvis, or when it has in great part emerged from the pelvic canal, and is resting on the perinæum. The circumstances which all admit to call for the use of the forceps, are the arrest of the head in the pelvis or at its outlet, from entire failure of the pains, or such a condition of the mother or the child as would place either or both in a state of risk in the event of delivery not being completed. Its most common use is in cases of suspended labour from inactivity or exhaustion of the uterus. As compared with craniotomy, it may be said to be a child's operation, but the forceps is not entirely, as Dr. Meigs would teach, a child's instrument, since it is sometimes used quite as much for the safety of the mother as of the child. Besides failure of uterine action, it is sometimes called for in consequence of moderate deformity of the pelvic outlet. In cases of twins it is occasionally necessary to use the forceps, to deliver the first child, when the head presents. It is used in face cases, particularly when the head of the child is large, and the pelvis of only moderate dimensions. In occipito-posterior presentations, when the head is large, and especially in first labours, the forceps may become necessary. In cases of arm-presentation with the head, the forceps may also be required. The instrument is used in some cases of funis presentations; in cases of turning, or breech-presentation, in which there is difficulty in delivering the head; in rupture of the uterus, when the head is low down, and is not retracted to any great extent; and in cases of convulsion, flooding, or any other accident of labour, which may render immediate delivery necessary to save mother and child from peril. The forceps is more often called for in primipara than multipara.

The conditions necessary to the use of the short straight forceps are, that the os uteri should be well dilated, and partly or entirely retracted over the head of the child. Dr. Meigs says that "a man shall hardly be justified who inserts his forceps within the os uteri. He must wait until the neck has risen above the parietal protuberance, and can no longer be felt." Dr. Ramsbotham states that it may be used in some cases where as much as a third part of the circular margin of the os uteri can be felt. I have no doubt whatever that its

FIG. 169.



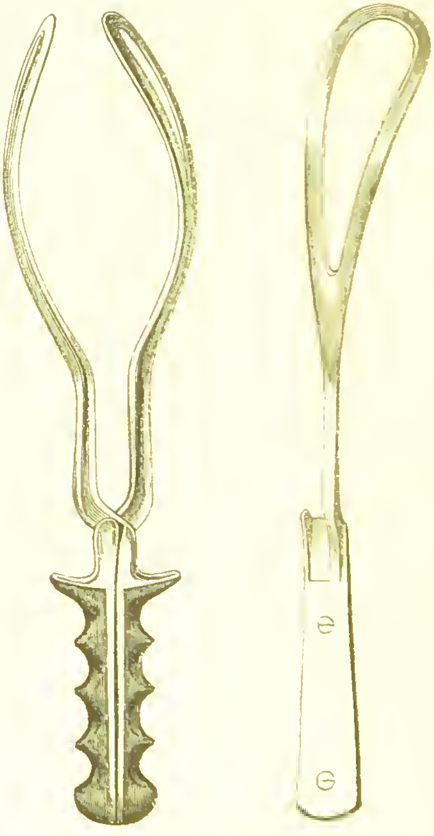
Short curved forceps.

use is often perfectly justifiable, when the upper part of the blades must enter the os uteri to extract the child. Dr. Lee insists greatly upon the full dilatation of the uterus, and says that the "greater part" of the head must have escaped from the uterus before the forceps can be safely used. Cases, however, occur in which the anterior lip can be felt in front of the head, when it rests on the perinæum: and others are met with, in which, though the os uteri is fully dilated, it is not retracted above the head. With many distinguished accoucheurs it is laid down as a rule never to apply the forceps unless an ear can be felt. The late Dr. Merriman especially affirmed that no case can be "esteemed eligible for the application of the long forceps until the ear of the child can be distinctly felt." There can be no doubt of the correctness of these dicta, as far as the short forceps commonly is concerned. Another rule is, that the head should have rested on the perinæum six hours, and the pains ceased for this length of time; but numerous cases in which the forceps is required entirely contravene this dogma. The use of the forceps should not be attempted when the os uteri is undilated, when the soft parts are in a state of inflammation, when the pains are violent, or when any considerable pelvic deformity exists.

Very numerous have been the minor modifications of the forceps, but some of the improvements of the instrument appear destined to last as long as the forceps itself. I have spoken of the single or Cranial Curve of the original instrument. To this, Smellie and Levret added another curve, the convexity of which looks towards the sacrum, and the concavity towards the pubis. This may be called the Pelvic Curve, to distinguish it from the curve already referred to. One curve has reference purely to the head of the child and the safety of the fœtus; the other relates entirely to the pelvic cavity, and is solely intended to shield the parturient canal from injury. Besides this, Smellie increased the length of the shank or space between the handles and claws, in connexion with the pelvic curve, with a view to the extraction of the head from the pelvic brim. This was the forerunner of the long forceps of the present day.

As regards the addition of the pelvic curve to the short forceps, authorities differ very considerably; but I believe that eventually the double, or the cranial and pelvic curve, will be generally adopted. By the use of the pelvic curve, less danger of those horrible accidents leading to vesico-vaginal fistula by pressure on the pubis, and to laceration of the whole of the perinæum, and fusion of the vagina and rectum by posterior pressure, is incurred. The short forceps with the double curve is commonly used, we are informed by Dr. Meigs, in America. Prof. Siebold of Berlin, and many others in Germany, have adopted the improved instrument, and its use is common in France. In this country, to which the forceps belongs *par excellence*, the double curve has found comparatively little favour, notwithstanding the excellent instrument and example of Dr. D. Davis, chiefly, as I believe, because the matter has not yet seized upon professional attention.

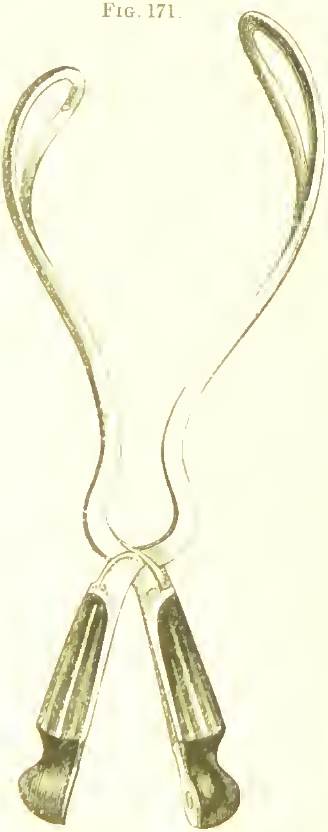
FIG. 170.



Long forceps.

The Long Forceps is an important alteration of the original instrument. It is not merely a variation of form, but it is applied to an order of cases altogether different from those in which the short forceps is useful. The short forceps is adapted for the delivery of the head from the perinæum, or the middle strait, or outlet of the pelvis. The Long instrument is suited to its extraction from the brim of the pelvis, or even from above the brim. For this reason, the shank is lengthened, and the best instruments possess the double curve, to adapt them to the axes of the pelvis and the parturient canal. For extraction when the head is at the brim, the short forceps is generally inadequate, without risking the laceration of the soft parts of the mother. One of the earliest anecdotes connected with the forceps, is that of Mauriceau, who relates that Dr. Hugh Chamberlen coming to Paris, rashly undertook to deliver a dwarf with deformed pelvis, who had been left to die by the French obstetrician, and after several hours of severe exertion was obliged to desist without completing the delivery. It is to relieve such cases, when the deformity is not too great, that the long forceps is peculiarly applicable, and, with the long instrument, Chamberlen might have been spared his own mortification and the censures of the great French accoucheur. Dr. Radford has devised a long forceps in which the blades are of unequal length, the short blade being intended to go over the occiput, and the long blade over the anterior part of the head, in ordinary vertex presentations.

FIG. 171.

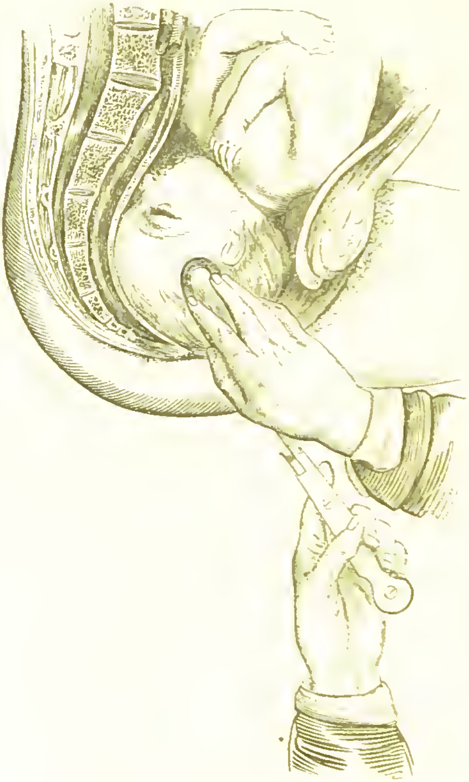


Radford's forceps.

As a preliminary to the use of the forceps, the bladder and rectum should be emptied, and the patient brought to the edge of the bed in the ordinary obstetric position. It is necessary that the nates should be brought to the edge, so as to project somewhat over it, particularly when the patient is stout, to allow of the necessary movements of the handles. If we do not arrange the position of the patient accurately in the first instance, we may have to withdraw one or both blades after the operation has been commenced, and begin again *de novo*. In the use of the straight forceps, our object must be to pass the blades of the instrument over the sides of the head of the child, so as to bring the parietal protuberances within the fenestra. We are at the same time obliged to consider the capacity of the pelvis in its different diameters, and it is found that the blades will pass in one direction when they will not pass in another. But our chief consideration, as regards the direction in which the blades are passed, is to be given to the fœtal head. The forceps may require to be passed over the head in any of the directions described when treating of the mechanism of labour. We may have to grasp the head in any of the four cranial positions described. The most common position in which the forceps is required is the first, in which the vertex is directed against the left branch of the pubis, and it is to this position that almost all the ordinary descriptions of the application of the forceps refer. In this position, the bilateral diameter of the child's head corresponds pretty accurately to the right oblique diameter of the pelvis, and it is in this diameter that the head is generally grasped with most facility. In the second position, the vertex is turned towards the right portion of the pubic arch. The third and fourth positions are merely the reverse of the first and second. Practically, we have, in ordinary cases of head presentation, in which the forceps may be required, to deal with the fœtal head lying with its longest diameter in the right or left oblique diameters of the pelvis. When the head lies in the right oblique diameter, we have to pass the blades of the forceps in the direction of the two extremities of the left oblique diameter, and *vice versâ*. When the long diameter of the head occupies the transverse diameter or nearly so, the blades of the instrument must approach the antero-posterior diameter. When the head rests on the perinæum, its long diameter approaches to the antero-posterior diameter, and we have to manipulate with the forceps almost in the transverse diameter of the pelvis. It has always been insisted on as a condition absolutely necessary to the proper use of the forceps, that we should know the exact position of the head. For this purpose we are told by many authors of the present day, to pass two or three fingers, or the whole hand, between the fœtal head and the pubis, to find out the position of the ear. But such manipulations are quite unnecessary, if we are familiar with the methods of diagnosing the position of the fœtal head by the examination of the sutures and fontanelles by the index-finger, as detailed when the different presentations of the head were under consideration. This ought to give us all the information we require in the use of the forceps as regards the position of the fœtal head.

Taking the first position for our description, the following is the mode of proceeding with the short forceps:—The first blade should be held lightly in the left hand, the first one or two fingers of the right hand being passed a short distance over the head, behind the right portion of the pubic arch. The end of the blade should now be introduced through the ostium vaginæ, and passed upwards between the finger and the head. In this procedure the handle of the instrument requires to be depressed considerably. The end of the blade should be kept lightly but pretty closely in apposition with the head as it glides onwards. With the finger we should aim, if possible, to pass the instrument over the ear of the child, and under the rim presented by the os uteri. When these cannot be felt, or when the blade cannot be passed, while the finger is at all deep in the pelvis, we shall find these obstacles are best perceived and avoided, by holding the instrument almost as lightly in the hand, as a probe. After the blade has first come in contact with the head, we must go on depressing the handle until we have reached the summit of the cranial vault. After this point, the handle has to be raised until it has passed over the side of the head, in the direction of the right foramen ovale. Care must be taken not to damage the ear, or the margin of the os; and in case of any difficulty, it is always right to withdraw the blade partially or entirely, in order to detect the impediment. The highest skill in the use of the instrument is to pass it with the utmost gentleness. We should, of course, know the position of the head in all cases. But it is not, after all, hair-breadth knowledge we require. The instrument is so admirable and perfect in its relations to the pelvis and the fœtal head, that blade, and head, and pelvis, concur in aiding the operator, and in depositing the instrument in the right place. The genius of Chamberlen assists, as it were, at every proper case in which his instrument is employed.

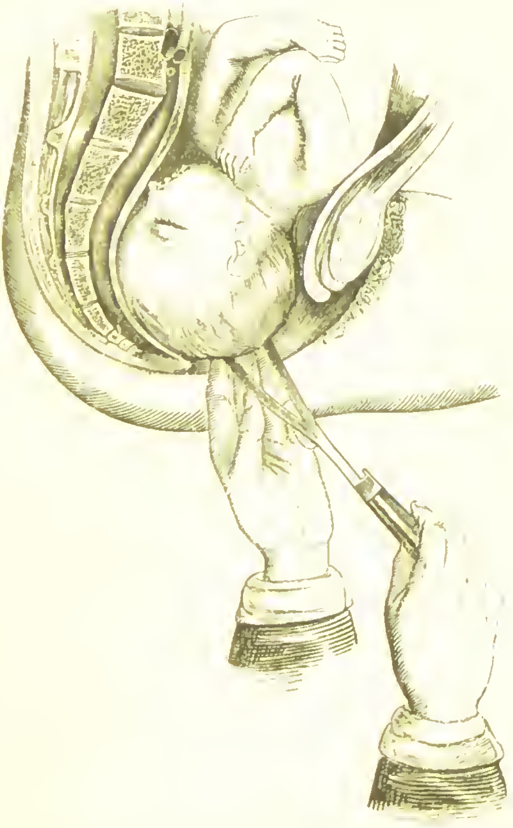
FIG. 172.



Introduction of the first blade of the forceps.

When the upper and anterior blade has been passed, the handle is brought towards the pelvis, and held there by an assistant, or the spare fingers of the operator, during the introduction of the posterior or inferior blade. It is more difficult to pass the second blade than the first, owing chiefly to the occupation of the vagina by the anterior blade. The first finger, or two first fingers, of the left hand have now to be passed over the head in the direction of the left sacro-iliac synchondrosis; and the second blade, held in the right hand, is to be passed, with the precautions already described, over the opposite side of the head. The handles should now be drawn together, and if the blades have been properly applied, the handles lock readily, and the position of the blades is rendered perfect and fixed by a moderate compression of the handles. Great care must be taken to guard the ostium vagina during the process of locking, so as not to pinch or

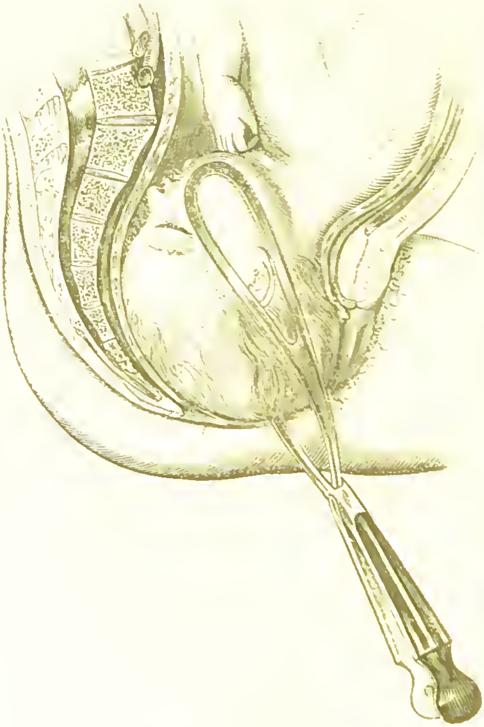
FIG. 173.



Introduction of the second blade of the forceps.

lacerate the soft parts of the mother. The inner smooth surface of the handles should always be parallel with each other when the instrument is rightly applied. If they are not even, the instrument is pretty sure to slip or unlock when traction is made. The handles should not be brought close together, but it is sometimes advisable to tie them, so as to prevent their unlocking in the intervals between the pains, and also to exert gentle compression on the fœtal head. During a pain,—when the pains have not disappeared,—the first effort at traction should be made in the direction of the pelvic axes, due regard being had to the position in which the child's head has descended. The traction should be gentle at

FIG. 174.



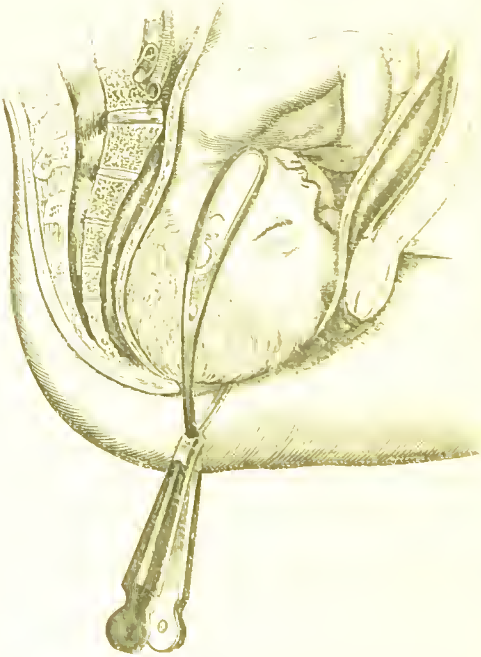
Delivery by short forceps in first position.

first, but gradually increased to the extent that may be necessary, intervals of rest being allowed when the pains are off, or in imitation of pains. Besides the efforts of traction, the handles should be moved a little from side to side in extracting, so as to use each blade in succession as a lever. As the head descends, the handles should be brought forward between the thighs of the mother, and as the head is expelled, they should, if the instrument remains on, sweep over the abdomen in the direction which the head itself would take if its movement were prolonged. When the head is emerging from the pelvis, we must be careful not to direct the handles too much backwards, as this endangers the bladder and the anterior vaginal wall from the anterior blade. When the head is on the perinæum, the handles should not be pressed too far forwards, otherwise the perinæum is ploughed up by the posterior blade. When the head is passing through the ostium vagina, care must be taken not to lacerate the perinæum. It is best at this moment to unlock the instrument, just as rowers unship their oars to avoid collision, or the posterior blade may be withdrawn altogether, and expulsion allowed to take place by the natural efforts. After the operation an opiate is generally administered, the vulva should be fomented carefully from time to time, and symptoms of inflammation or sloughing carefully attended to. I am of opinion that in cases where the patient does not prefer to remain conscious, or when the head is very low on the perinæum, chloroform should be used in delivery by the forceps. In the first case in which I used chloroform in a forceps case, the instrument was applied to the head without it by the medical man who asked my assistance; but the patient was of nervous temperament, and on the slightest attempt at traction her movements were so violent as to render it impossible to proceed, and the alternative was between chloroform or craniotomy. The advantages of having the patient quiet and free from pain are very great. The forceps acts as an extractor, a double lever, and a compressor. The limits of its action as a compressor must depend on the difficulties to be overcome, due regard being had to the safety of the child.

In the other positions of the head, or in face cases requiring assistance, the same general principles are to be followed in applying the short forceps as those already laid down. To operate perfectly, the blades of the forceps should always be applied to the sides of the head; they will thus, as the rule, occupy the diameters of the pelvis opposite to those occupied by the long diameter of the head. One of the most difficult is the occipito-posterior position, which is not very common, but it has happened to me to meet with two primiparous cases of this kind in which the forceps was necessary. One of them I saw with Dr. Gueneau de Mussy, and the other with Mr. Jonson, of Eaton-place. In delivery with the forceps in occipito-posterior presentations, the head should be slowly rotated during the process of extraction, so as to bring the vertex towards the pubic arch, and thus convert them into occipito-anterior presentations.

The Long Forceps is adapted for the completion of delivery in cases of moderate contraction of the pelvis, especially in the

FIG. 175.

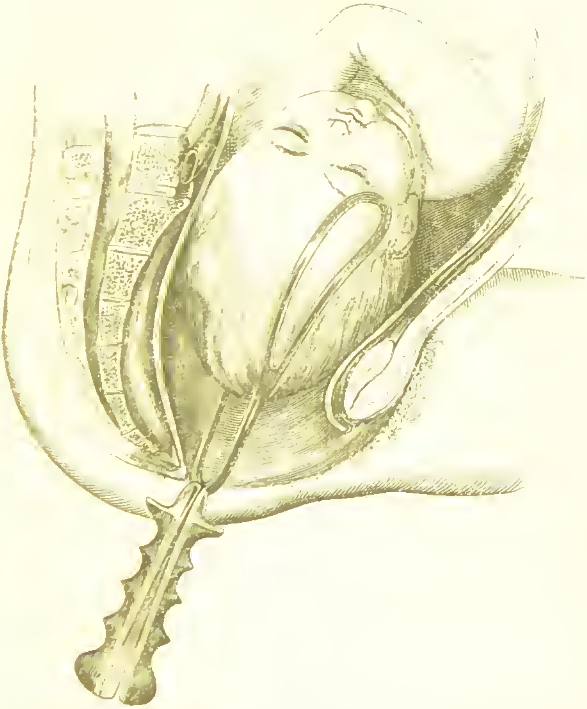


Delivery by short forceps in occipito-posterior position of head.

conjugate diameter, where the head will not enter the brim, or descend below it, by the unaided force of the uterus, or where the head lodges at the brim from any other cause. When the head presents at the brim, it will be remembered that the long diameter lies in the transverse, as in one of the oblique diameters, or more commonly in a position between the transverse and one of the oblique diameters. The head of the child is also in the state of Flexion—that is, with its chin bent upon the sternum. As a consequence, the vertex, and not the apex, of the vault of the cranium, is the most depending part. Under these circumstances, the blades of the forceps cannot be applied on each side of the child's head, because these sides are in apposition with the pubis and the sacral promontory, between which points the constriction exists. The forceps are in such cases introduced chiefly with reference to the anatomy of the pelvis, and not to the anatomy of the fœtal head. The two blades are passed up, one on each side of the pelvis, and they then fall mechanically into, or approach towards that oblique diameter, opposite to the diameter which is occupied by the head itself. The parts of the fœtal head actually grasped by the blades are the occiput and the forehead. The grasp does not, however, seize the long diameter of the head exactly, but a diameter between the longitudinal and the transverse or bi-parietal. The ends of the blades reach, on one side to the nape of the neck, and on the other to the base of the brow, but they do not pass over the face. Greater care is necessary in extracting with the long than with the short forceps, because the direction in which extractive power has to be exerted is more complicated, and because the instrument is more powerful than the short forceps. Care should be taken not to use such force as may injure the mother; and if, after endeavouring, within this limit, to effect delivery, we are obliged to resort to craniotomy, we shall perform this operation with less hesitation or misgiving when we know that no alternative remains.

No doubt, the use of the long forceps is a weighty matter, and not to be undertaken without due and serious consideration. But the alternative must be remembered—namely, the performance of craniotomy, and the inevitable destruction of the child. By craniotomy, too, a far greater amount of danger to the mother is incurred. In cases of pelvic contraction, to such an extent as not utterly to preclude the possibility of the passage of a living child, the long forceps should always, unless some great peculiarity exists, be tried. After attempting delivery in this way, we shall, as already said, certainly resort to craniotomy with a clearer conscience, than would otherwise be the case. In London the use of the long forceps has been a subject of grave dispute. Dr. Lee, one of the most experienced obstetricians of this or any other age, may be said to represent those who oppose its use; but Dr. Ramsbotham and others defend it. It has long been used in Edinburgh by Dr. Hamilton and Dr. Simpson. In Dublin it has found little favour, particularly at the great Lying-in Hospital, the different masters having opposed its employment; but Dr. McClintock, the present master, a most accomplished and unprejudiced obstetrician, who was recently in London, informed me that he had, within a short time, used the long forceps on two occasions with success, and he expressed himself a convert to its use. Dr. Fleetwood Churchill also recommends its employment. Its utility is fully recognised in America, and also in France and Germany. The chief objection urged against the use of the long forceps is, the injury done to the mother by operations above the brim. But most of these injuries have been owing to the use of the short forceps in this situation, for which they are not at all adapted. The impossibility of introducing the forceps in distortions of the brim has been dwelt upon, but this difficulty chiefly applies to attempts to introduce the blades in the antero-posterior diameter. In the transverse diameter, or in the oblique diameter opposite to that in which the head engages, there is often as much room in contraction of the conjugate diameter as in the normal pelvis. It has also been urged that the action of the forceps, as a compressor, acting from the sides of the pelvis, must bulge the bi-parietal diameter, or that part of the head opposed to the conjugate diameter of the pelvis, and thus increase the difficulty of the passage of the head. But, as already stated, the forceps seizes the head obliquely, and not in the antero-posterior diameter, so that any retardation caused by the bulging of the head is more than compensated for by the extractile action of the forceps. The supposed injuries done to the face of the child have been dwelt on, but it can be shown anatomically, and as the result of practice, that the anterior blade of the forceps does not extend beyond the root of the nose. The objections to the use of the long forceps are, in my opinion, either prejudiced or invalid, and such as, on the introduction of the short forceps, might have been urged with almost equal weight against that instrument.

Fig. 176.



Delivery by Dr. Simpson's long forceps in contraction of the brim.

The Vectis, or Lever, was formerly much used in difficult labours, but for a long time it fell into desuetude, having been completely superseded by the forceps. In recent years, its use has been revived to some extent, to rectify mal-positions, and expedite delivery. One blade of the short straight forceps makes a very good vectis, and will do all that can be effected with this instrument.

CHAPTER XLVI.

EMBRYOTOMY.

This is the most positive of all the operations of midwifery. The only other procedure with which it bears comparison, is the induction of premature labour before the viability of the child has been reached. In the Induction of Premature Labour after the seventh month; in Turning; in the use of the Forceps, and even in the Cæsarian section, a chance of safety is afforded to both mother and child; but in Embryotomy, the child, if alive before the commencement of the operation, is inevitably sacrificed.

The operation is considered necessary in certain cases of deformed pelvis, obstruction from tumours, &c., when the induction of premature labour has been neglected or omitted; in cases of arm presentations, hydrocephalus, convulsions, hæmorrhage, exhaustion, &c., when the preservation of the mother imperatively calls for delivery, and when the child cannot be extracted by the long or short forceps, or by turning. Under these circumstances, there is no question amongst the great majority of British accoucheurs as to the propriety and fitness of the performance of craniotomy or embryotomy. As Denman justly observes, in deciding in favour of this operation, we are only following the dictates of Nature, who, in difficult labours, commonly sacrifices the child before the mother is destroyed. It is equally a canon in obstetrics, that the operation should never be performed except after consultation, and in the face of the most urgent necessity: and it may be said that, apart from all question of the Cæsarian section, there is a general belief on the Continent, and in America, having, I fear, a foundation in truth, that the operation has always been performed too frequently by obstetricians in this country.

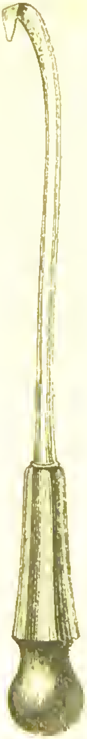
It is of the greatest importance, with reference to the most common condition of instrumental labour—namely, slight or excessive deformity of the pelvis, that the limits should be decided, as far as possible, within which the induction of premature labour by the forceps may, or craniotomy should be, performed. As regards the induction of premature labour, it may be said that it applies to ALL cases of pelvic deformity, it being the province of art to decide at what time this operation should be performed in each particular case, and whether it should be resorted to before or after the viability of the child. There is, probably, no case of deformity or exostosis, where menstruation and fecundation can occur, so profound but that the detachment and expulsion of the ovum might be procured within the first two or three months after impregnation, by the uterine sound, or an elastic tube and douche. When this has not been accomplished, and pregnancy has gone on to the full term, we have to consider the alternative operations of the forceps, turning, embryotomy, or the Cæsarian section. The use of the forceps is generally inadmissible in cases where the distortion exists to such an extent that the antero-posterior diameter is below $3\frac{1}{4}$ inches. When the application of the long or short forceps is impossible, turning may be practicable between the limits of $3\frac{1}{4}$ inches and $2\frac{1}{2}$ inches. The Cæsarian section comes into the field in cases of high and unyielding distortion, where the antero-posterior diameter is $1\frac{1}{2}$ to 2 inches or less. Between the point at which turning becomes impracticable, and at which there is no resource but the Cæsarian section, lies the domain of craniotomy. It is the proper resource in cases where the antero-posterior diameter is from $2\frac{1}{2}$ inches to $1\frac{1}{2}$ to 2 inches. In cases where some other condition than mechanical disproportion comes into operation, as in cases requiring immediate delivery, and complicated with hæmorrhage, convulsions, &c., craniotomy may be sometimes necessary, but it ought in every case, as far as possible, to be superseded by the forceps or by turning where these operations are practicable.

The statistics relating to embryotomy are of great importance as throwing light on the proportion in which the operation is fatal to the mother. Dr. Fleetwood Churchill has collected 342,495 cases of labour in German practice, in which embryotomy was performed 243 times, or in 1 every $1409\frac{1}{2}$ cases. In 129,331 cases in British practice, embryotomy was resorted to 378 times, or in 1 in every $342\frac{1}{2}$ cases! In France and Italy, out of 38,908 cases, this operation was performed 69 times, or in 1 in every $563\frac{3}{4}$ cases. Thus the proportionate frequency of the operation stands as 1 in every 342 cases in this country, 1 in every $563\frac{3}{4}$ in France and Italy, and only 1 in $1409\frac{1}{2}$ in Germany! In 371 cases in which the result to the mother is stated, death ensued in 69, a fatality equal to 1 in $5\frac{1}{3}$ of all the cases. Thus craniotomy, though a comparatively easy operation, is far more fatal to the mother than the forceps or turning. In this country 1 in every $20\frac{3}{4}$ amongst the mothers is lost by the use of the forceps; and in France and Germany, 1 in $14\frac{3}{4}$. In cases of turning, the loss is 1 in every $14\frac{1}{2}$ cases, including deaths from the complications in which turning is required, such as convulsions, accidental hæmorrhage, placenta prævia, &c. Some further light is thrown upon the comparative mortality of the several midwifery operations by a comparison of the results of artificial delivery in this country and on the Continent. Dr. Simpson gives the comparison of the maternal mortality after artificial delivery in the great hospitals of Vienna and Dublin as follows:—Under Boer, 1 in 55 was delivered artificially—that is, by the forceps, lever, version, or craniotomy. Under Arneth, artificial delivery was resorted to in 1 out of every 69 cases. In Dublin, under Dr. Collins, 1 out of every 86 women was delivered artificially; and under Dr. Johnson, as reported by Drs. Hardy and McClintock, 1 in 52. Of the cases above mentioned, Boer lost 1 out of every 17 mothers; Arneth, 1 out of every 9; Dr. Johnson, 1 out of every 5: and Dr. Collins, 1 out of every 4. These figures would give Dr. Collins a mortality more than four times greater than that of Boer, and twice that of Arneth. Dr. Collins, it may be observed, resorted to artificial delivery less frequently than the Vienna obstetricians; but Dr. Johnson's proportion of artificial deliveries was greater than either that of Boer or Arneth. On the Continent, the forceps is more frequently used than in this country. The French use this instrument in 1 out of 140 cases; the Germans in 1 out of every 159; while in Great Britain it is only used in 1 out of every 342 cases. The same may be said of turning. The French turn in 1 out of every $89\frac{1}{2}$ cases: the Germans in 1 out of every $97\frac{1}{2}$; while in Great Britain we turn only in 1 out of every 238 cases. As already mentioned, the maternal mortality from forceps cases in this country is 1 in $20\frac{3}{4}$: in France and Germany, 1 in $14\frac{3}{4}$. The gross mortality to the mother from turning is 1 in every $14\frac{1}{2}$ cases; while that from craniotomy is 1 in $5\frac{1}{3}$. Thus on the Continent, a considerable gain of maternal life is obtained by resorting to turning and the forceps, instead of craniotomy. When the child is dead, turning is performed, or the forceps used, in preference to craniotomy: and turning is resorted to in cases of dystosia, when the head of the child is above the brim, and when the pelvis admits of delivery without diminution of the head. Artificial delivery is also resorted to at an earlier period on the Continent and in America, when it is considered necessary, than in this country, and Dr. Simpson has shown that no other circumstance exerts so prejudicial an effect, as the prolonged duration of labour. While it must be allowed that in the matter of artificial deliveries more mothers are lost in this country than on the Continent, the gross maternal mortality in this country is more favourable than in foreign countries. But it is not only as regards the mother that our own statistics of artificial delivery are unfavourable. Out of every 100 cases, Boivin lost 28 children; Arneth, 34; Lachapelle, 36; Boer, about 47; Dr. Johnson, 76; and Dr. Collins, 77. If we can rely on these statistics, which there is little reason to doubt, the fœtal mortality in this country in artificial deliveries is nearly double that which obtains upon the Continent. The result of these statistics is to show very clearly that craniotomy is an operation to be avoided upon every possible occasion, and that in no case should it be undertaken, whether the child be alive or dead, when turning or the short or long forceps can be substituted in its stead. It is only less horrible than the only alternative which remains to us, when it is absolutely unavoidable—namely, the Cæsarian section, and in the following proportions:—Embryotomy is fatal to the mother in about 20 per cent., while the Cæsarian section destroys from 60 to 70 per cent. on the Continent, and between 80 and 90 per cent. of the mothers in cases operated on in this country.

When the deformity is not excessive, the operation is a comparatively easy one. It is only in cases of high distortion, where what is called piecemeal extraction is required, that great difficulties are met with in its performance. The instruments used consist of the Perforator, the Crotchet, the Embryotomy Forceps, the Cephalotribe, and several kinds of blunt and cutting Hooks.

Various forms of perforators are used. The most common is the scissors-like instrument of Smellie, modified to some extent by later obstetricians. It consists of two blades with shoulder-stops, and cutting edges between the stops and the points. In using the instrument, it is inserted as far as the stops, and the handles are then separated by the fingers. The most modern and perfect instrument is a modification of Naegelé's perforator, which is used by bringing the handles together; and gives the operator considerably more power than the instrument of Smellie. The common crotchet is a modification of the earliest modern instrument of the kind, devised by Mesnard. It is simply a blade, having the forceps curve, with a short hook at the extremity, having a broad cutting edge of moderate sharpness, for insertion into the inner or outer surfaces of the bones of the fœtal cranium. Its construction was probably suggested by the use of the hooked finger and the finger-nail. Various forms of craniotomy forceps are used, some of them with sharp teeth, and others with serrated blades, the latter being in most cases the prefer-

FIG. 177.



Crotchet.

FIG. 178.

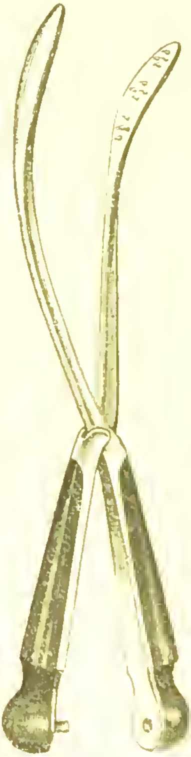
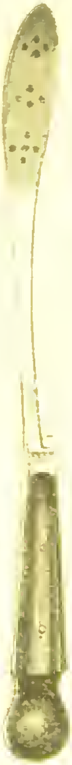


FIG. 179.

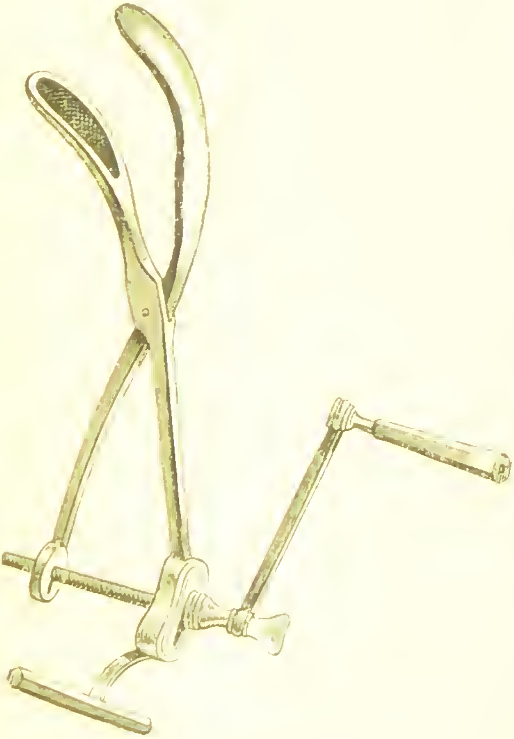


Craniotomy forceps.

able instruments. In some, the scissors-joint, and in others the forceps-lock, is used. The cutting-hook, invented by Dr. Ramsbotham, for cases requiring decollation or the amputation of limbs, and a blunt hook, complete the embryotomy instruments in general use in this country.

In the Cephalotribe, a mechanism altogether different is relied upon. Immense strength in the blades, and great power of compression is obtained, and the fœtal head, including its base, is crushed by the grasp of the instrument. The cephalotribe of Baudelocque is two feet in length, and weighs about four pounds, being altogether a most repulsive-looking instrument. The crushing-blades are brought together

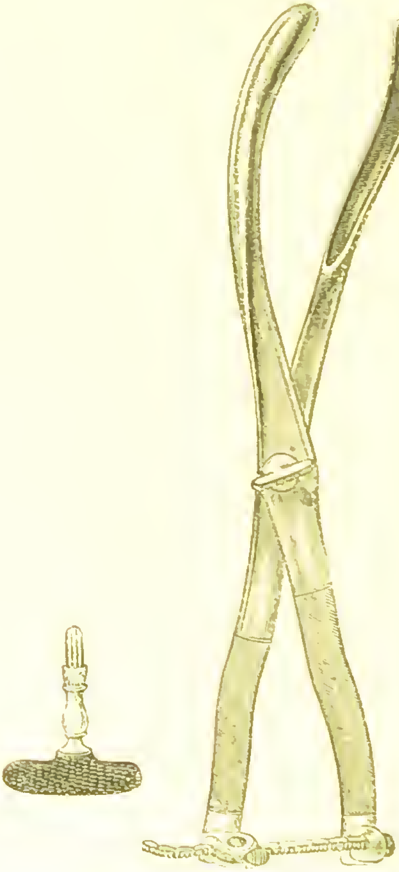
FIG. 180.



Baudelocque's cephalotribe.

by a screw-movement. A more modern French cephalotribe, consisting of an immensely strong pair of forceps, having narrow blades, without fenestra, was exhibited at the Crystal Palace of 1851. It was several pounds in weight, and its use must have required great strength on the part of the operator. Recently, considerable attention has been given to the construction of cephalotribes of as light a weight as is consistent with the requisite strength, and the racket and pinion has been sub-

FIG. 181.

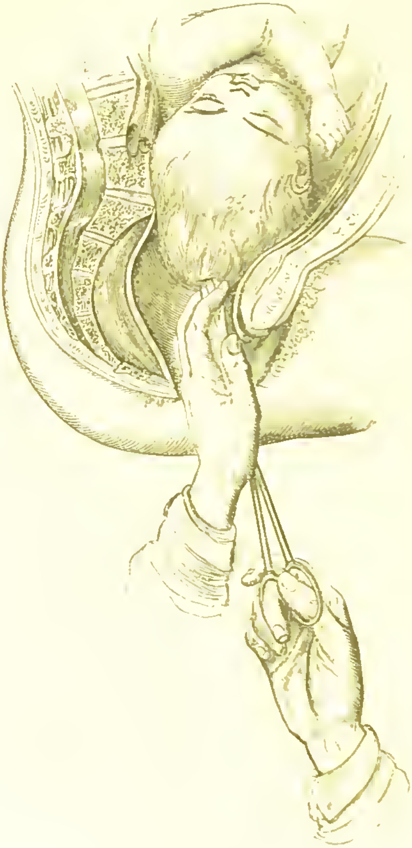


Scanzoni's cephalotribe.

stituted for the screw in approximating the handles. (Fig. 181.) The latest instrument I have seen measures 18 inches in length; its blades are 1¾ inches in width, and it weighs 3 pounds. The lock of the blades is the same as that of the French forceps. The cephalotribe is used by Paul Dubois and the leading French obstetricians, in preference to the perforator and crotchet, in cases where the child is dead, or where the pelvis is too contracted to admit of the use of the forceps. The advantages claimed for this instrument are, that it avoids the dangers of the crotchet, and that it is far less fatiguing to the accoucheur than the ordinary mode of extraction. It is not, of course, applicable to cases of high pelvic distortion. It is impossible to examine the instruments used in embryotomy, and to deal with cases requiring its performance, without feeling that instrumentation has by no means reached perfection in this department of the obstetric art. Ultimately craniotomy will, in all probability, be restricted almost, if not entirely, in the case of living children, to cases requiring piecemeal extraction. We require instruments for this purpose better than any which have hitherto been constructed, and it seems likely that modifications of the lithotrity and bone-cutting instruments used in general surgery may be found very useful in breaking up and extracting the fœtal head.

In using the perforator, the first two fingers of the left hand are introduced into the vagina so as to reach the parts of the head selected for puncture. Along these fingers, the instrument is passed as on a director, and, with the right hand, forced gently but firmly, by a semi-rotatory movement, into the head as far as the shoulder-stops. The blades are then opened widely, and the part of the head into which they are introduced is thus divided. The instrument is now withdrawn a little, and re-inserted in a direction at right angles to the first incision, when the blades are dilated as before. This proceeding leaves a crucial opening in the fœtal cranium. The point of the head at which the perforation should be made has been a subject of considerable dispute. Some advocate perforation at the sutures or fontanelles; but it is an objection to this procedure, that when the bones become compressed, the opening is obliterated, and the discharge of cerebral matter interfered with. The best point for perforation is the middle or posterior portion of the parietal bone, because an opening in this situation enables the operator to apply extractive force with the head in the most natural and advantageous position for its passage through the pelvis. When the crucial incision has been made, the perforator is passed

FIG. 182.

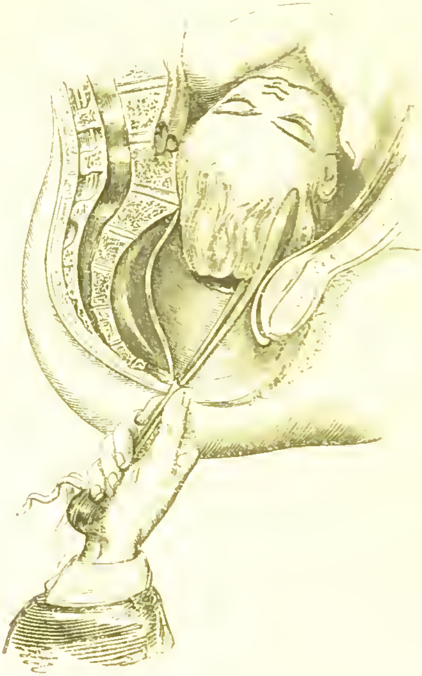


Perforation of the head.

into the opening and moved about in various directions, so as to break up the brain. If the child is alive, the perforator should, if possible, be made to pass into the foramen magnum in order to destroy the medulla oblongata; otherwise the child may be born living, notwithstanding the processes of perforation and decerebration. Sometimes the crotchet is used as a perforator for breaking up the brain. Nothing but pithing the medulla destroys the child, which before birth possesses, to a certain extent, the low and tenacious vitality of the amphibia. After these steps of the operation have been completed, it is best, in all cases where immediate delivery is not a matter of great urgency, to wait for some time before proceeding to extraction. The bulk of the fœtus is diminished by loss of blood, and as the brain escapes, the spastic influence of the pains moulds the bones of the cranium into a smaller and more convenient shape. Decomposition also sets in with great rapidity, and soon softens the whole mass.

For extracting the child, especially when the fœtus is dead before the commencement of the operation, it is sometimes sufficient to pass the finger into the opening made by the perforator, and in this way extract the child. More frequently, the crotchet or craniotomy forceps is required; and some cases tax the strength, ingenuity, and patience of the accoucheur to the very utmost. Considerable difference of opinion has prevailed at times as to the mode of using the crotchet. Some have fixed the instrument on the outside, others on the inside, of the cranial cavity; and occasionally, two crotchets, one applied externally and the other internally, have been employed. At the present day, obstetricians are pretty well agreed as to the propriety of passing the crotchet through the opening made by the perforator, and fixing it upon the cranial bones on their inner surface. It is still a disputed question whether the crotchet should be fixed upon the anterior or posterior part of the head. Supposing the head to be in either of the occipito-anterior positions, in applying the crotchet to the anterior part of the head, we can pass the fingers of the left hand up over the frontal bone, to the part opposite to that upon which the crotchet is fixed, and in this way steady the instrument, assist its extractive force, and guard against the injury of the soft parts in case of the slipping of the instrument. But these advantages are more than counterbalanced by the circumstance that we in this way bring down the anterior part of the head, and force the cranium through the pelvis in its largest and most unfavourable diameter. In fixing the crotchet on the thickest portions of the occipital, parietal, or temporal bones, we, on the contrary, bring the head down with its smallest diameter opposed to the pelvic straits, and in this way expedite delivery, and avoid the danger of bruising and lacerating the

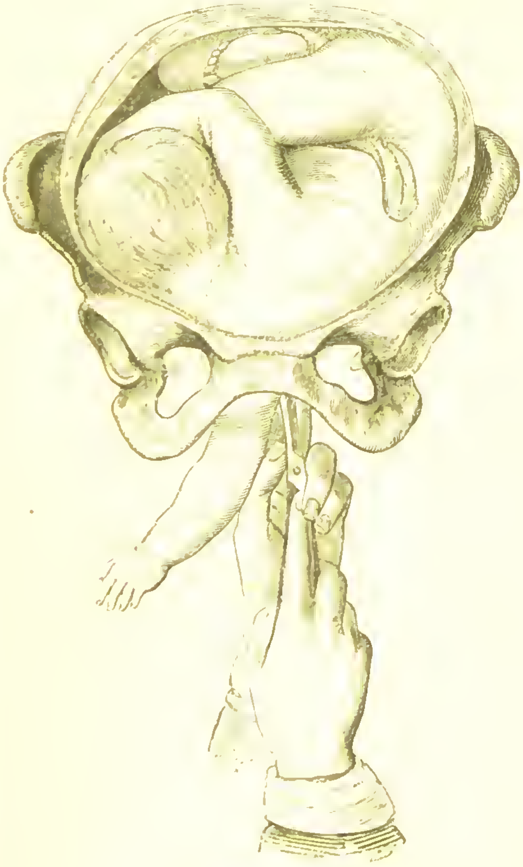
FIG. 183.



Employment of craniotomy forceps.

soft parts of the mother. Cases may occur in which we have little choice, and in which the head must be extracted or broken down as it lies; but when we can select any part of the head, or are able to alter its position, undoubtedly the greatest chances of safety are given by following as closely as possible the natural order of labour, and bringing the posterior and superior angle of one of the occipital bones first through the pelvis. Sometimes the craniotomy forceps, the blunt hook, or even the ordinary forceps, is used, after the collapse of the head, to effect delivery; and in the worst cases the craniotomy forceps is more serviceable and less dangerous than the crotchet. With any of these instruments the greatest care is necessary in guarding the soft parts of the mother from injury, and avoiding lacerations of the vagina and perinæum by the instrument or by spiculæ of bone. Great force is sometimes required with the crotchet and craniotomy forceps, and the completion of delivery may occupy many hours. As far as possible, it is a rule in craniotomy to save the scalp and integument, so as to cover and guard the bones from injuring the mother.

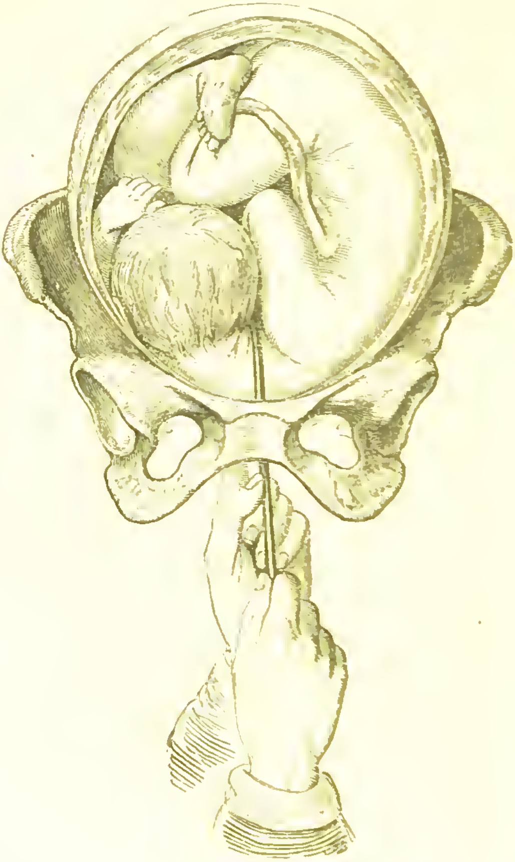
Fig. 184.



Embryulcia.

In embryulcia, when some other parts than the head present, the abdomen and thorax require to be perforated, and the child extracted as in breech cases. Occasionally, it is necessary to effect decapitation. In some cases, when craniotomy has been performed, and the head extracted, it is difficult or impossible to deliver the trunk, and the thorax and abdomen require evisceration. Dr. Oldham has for such cases

FIG. 185.



Decapitation.

invented a vertebral hook, considerably longer in the shaft than the ordinary blunt hook, and calculated to be of very great service.

In cases of high distortion, such, for instance, as those described by Dr. Osborn and Dr. Meigs, extraction by any instruments would be impossible without the assistance afforded by the decomposition of the fœtus. These cases sometimes spread over two or three days, in which time the soft parts of the fœtus are reduced almost to a diffluent pulp, and the loose bones are contained within the skin somewhat as in a bladder. The fœtor in these cases is great, and the uterus may be distended with gases resulting from decomposition; but less mischief arises from these sources, or from the delay and pressure, when the cranium has been decerebrated, than from forcible attempts at extraction. It is very common with those obstetricians who have most distinguished themselves in such cases to express a regret, at the termination of their cases, that they did not wait more patiently, and trust more to the aid afforded by putrefaction. It is almost incredible how small an aperture a fœtus in a state of decomposition will pass through. Dr. Simpson, in a case occurring at Cupar, was able to draw a child 18½ inches long, in a state of considerable decomposition, through an opening in a piece of iron only 2¾ inches long by ⅞ of an inch wide. When we have to deal with a dead fœtus, the circumstances under which craniotomy can be performed in high distortion, are the most favourable which can exist; and when the fœtus is destroyed early in labour, a few hours will do much towards promoting decomposition, so that if extraction can be delayed twenty-four or thirty-six hours, the fœtus becomes greatly disorganized. Death, the admission of air, and the high temperature kept up by the uterus and liquor amnii, afford very favourable conditions for putrefaction in the comparatively soft structures of the fœtus. It were to be wished that art could supply some means of making fœtal decomposition still more rapid in such cases. But even in cases of decomposed fœtus, the cranium has, in the worst cases, to be picked out bit by bit and bone by bone, or the large bones have to be broken up. In his case of delivery in a pelvis of two inches in the antero-posterior diameter, Dr. Meigs relates that he was occupied several hours in getting away as much osseous matter as would go to make up a parietal bone.

Considerable difference of opinion has existed as to the time at which craniotomy should be performed. Dr. Collins has especially laid it down, with almost the distinctness and positiveness of a law, that in difficult labour the child is always dead before the mother is placed in such a position of danger as to require immediate delivery. Drs. Hardy and McClintock have followed Dr. Collins to a considerable extent in this particular. The wisdom of the rule thus sought to be enforced by these eminent accoucheurs may, however, be questioned. When there is a positive certainty that the child cannot be born alive—when turning is impracticable, or when delivery by the forceps has been vainly attempted, there is no object to be gained by delay. There is little distinction, in a moral point of view, between standing by while the fœtus dies and the actual performance of craniotomy; but it may make every difference to the chances of safety to the mother to have to deal with a dead fœtus upon whom perforation has been performed, and in whom the processes of putrefaction and softening are going on, and with the solid head of a living child, pressing under the force of uterine action, upon the soft contents of the pelvis. No doubt it must always be a satisfaction to know, when the certainty arises that craniotomy is inevitable, that the child is already dead; but this event cannot, in cases of high distortion at the full term, be waited for except with risk to the mother. It would probably be better to be without auscultation altogether, in such cases, than to make it the ally of timidity and procrastination. In every case where the smallest promise of such a solution of the difficulty exists, turning or the application of the long or short forceps should be attempted; but the moment we are positively certain that the head cannot pass naturally or artificially without perforation, but that with perforation it may pass, we should prepare for craniotomy, with little reference to the question of whether the mother can bear an hour or two of additional suffering, or whether the child may linger a few hours more or less before it expires from compression.

CHAPTER XLVII.

THE CÆSARIAN SECTION.—CHLOROFORM.

The Induction of Premature Labour, Turning, and the use of the Forceps, are the great operations of what may be termed Conservative Midwifery. Opposed to these are two capital operations, never to be resorted to save in the last necessity—namely, Craniotomy, which has been considered in the preceding chapter, and the Cæsarian Section or Hysterotomy. In the one the mother is almost surely, in the other the child is certainly, sacrificed. Premature Labour, Turning, and the Forceps are in distinct antagonism to Embryotomy and Hysterotomy, and the tendency of all obstetric improvements has been to substitute the conservative for the destructive operations, and to circumscribe more and more the ground which the latter occupy. The Cæsarian section was probably suggested by cases in which gravid women had the mature fœtus forced through the uterus and abdominal walls by accidents, such as falls, or the goring of bulls; or by those rare instances in which, in cases of impassable deformity of the pelvis, the uterus and abdominal parietes have been ruptured by the force of the pains, and the child extruded. The operation is of very ancient date, like most of the capital operations performed on the human body. Esculapius himself, and a number of other ancient and Middle-age celebrities, are said to have entered the world in this manner. Art does not appear to have diminished the dangers or the mortality of the operation. With one or two exceptions it is, and probably will ever remain, the most formidable operation which can be performed upon the living body.

Dr. Fleetwood Churchill has carefully collected the statistics of abdominal hysterotomy. He collected from foreign authorities the particulars of 371 cases in which the operation was performed. Of these, 217 mothers are reported to have recovered, and 154 to have died, the deaths being 1 in 2⅓. Some of these cases are, however, so old, as to be traditional rather than historic; but the records of 321 operations, which have occurred since the year 1750, show that only 149 mothers recovered, to 172 deaths. Kayser collected 339 cases, in which a fatal result occurred to the mother in 210 cases, 129 mothers being saved. Dr. West has noted 409 authentic cases: in 251 the mothers died, and the recoveries were 158. The largest statistic of this operation is that of Figueiria, who gives 790 cases, in which the deaths were 424, leaving 366 recoveries. Many of the cases are, of course, repeated in these several collections, but they give, no doubt, a tolerably correct account of the mortality of the operation. In Great Britain, the operation has been considerably more fatal than on the Continent, the difference probably arising from the fact, that here the operation is commonly resorted to only after labour has continued for some time, and after other means of delivery have failed, while abroad the operation has been performed on healthy women, the subjects of deformity, at the commencement of labour. Dr. Merriman collected the results of 26 cases occurring in this country; of these only 2 mothers were saved, and 24 lost. Dr. Churchill has analysed 63 British and American cases, out of which 18 mothers recovered to 45 deaths. In the great capitals, London, Paris, and Vienna, the mortality is far greater than in other places, and with the single exception of Dr. Oldham's case, where the patient suffered from carcinoma uteri, and died a considerable time after the operation, I believe abdominal hysterotomy has never been performed successfully in this metropolis. Within the last few years it has been performed in London under every circumstance which could be devised to procure a favourable result, five times, with a fatal result in four cases. Dr. Oldham's case was probably an exemplification of the law, that the abdominal and pelvic organs while in a state of disease bear operations well. The most favourable of these results are sufficiently discouraging, when viewed in a tabular form. The matter is still more tragic when we come to the individual case, and have to estimate the chances of recovery from such a formidable operation. It must be borne in mind that the known statistics of the Cæsarian section are sure to be more favourable than the real results. Successful cases are certain to be blazoned abroad, and those which are unsuccessful mentioned as little as possible. Kayser observes tha the recorded mortality from this operation in lying-in hospitals, where all the cases are reported, is considerably greate than the recorded mortality in private cases, where suppressions are possible. The hospital mortality reaches to 79 pe cent. Dr. West places the mortality in this country, at the lowest estimate, at 83·6 per cent.; but even this is probably lower than the real mortality, could every case be collected. Of the five operations performed in London within the last few years, one of the fatal cases has never, as far as I am aware, been reported.

Dr. West has made a very able analysis of the cause of death, and the date of its occurrence, in 147 cases of death from the Cæsarian section. His table shows that death is distributed between shock, hæmorrhage, and inflammation. 55 cases died of inflammation between the 2nd and 20th day, and 1 after that time. The number of deaths from shock to the nervous system was 33, the period of death varying from one hour to six days after the operation. 14 cases died of hæmorrhage, between the time of the operation and the sixth day. The deaths in the remaining 44 cases took place from the combined results of hæmorrhage, shock, and inflammation, or from causes independent of the operation itself. The fatal result takes place with great rapidity in the majority of cases, as shown by the fact, that out of the 147 cases tabulated by Dr. West, death occurred in 108, within 96 hours after the operation. Dr. West sums up the peculiar dangers of the operation under four heads:—1. Hæmorrhage, not only from the wound, but from the placental site. 2. The shock to the nervous system from the violent interference with labour, and the injury inflicted on the uterus. 3. The exposure and incision of the healthy peritoneum. 4. The infliction of an extensive wound upon the uterus at a time when the processes of Nature are prepared, not to carry on reparation, but to effect the degradation, disintegration, and absorption of the uterine tissue. Attention has been specially directed to the state of the uterine wound after the operation, by Dr. West. In many cases no attempt at repair or the formation of new tissue takes place; in others, actual sloughing and loss of substance occurs, the wound gaping widely, when death has occurred many days after the operation.

The Cæsarian section has been resorted to for the safety of the child more frequently than for that of the mother, but the statistics of the operation demonstrate beyond question that the amount of fœtal mortality is very great indeed. In Dr. Churchill's list of 371 cases, the results to the child are given in 189 cases, 139 being saved, and 50 lost. But we may fairly infer that, of the 182 cases where the result is not given, the child was lost in all, or nearly all, which would, omitting twins, increase the fatal mortality to 232. Of the 63 occurring in British practice, 26 children were lost or still-born, and the result is not stated in 3 cases, making the probable mortality 29. In Dr. Merriman's collection of 26 cases, 11 children were saved and 15 lost. In the 409 cases mentioned by Dr. West, the result to the child is stated in 347 instances. In 237, the child was born alive; in 110 it was still-born. If we add the unrecorded cases to the deaths, the number becomes 172, exclusive of twins.

In a considerable number of cases it is a remarkable fact that the operation has been performed more than once upon the same subject. In 28 women whose cases are collected by Dr. Churchill, the operation was performed 74 times. Some of these cases have been doubted, on account of their antiquity; but within our own generation, Professor Kilian, of Bonn, performed the operation four times on the same woman. Between the years 1826 and 1836 it was also performed four times on a Danish woman. It would appear that in women who survive the first operation, a certain immunity from the dangers of the procedure is acquired. These cases, subtracted from the tables of the successful performance of the operation, or reckoned only once, increase the tabular mortality in women operated on for the first time.

We now approach one of the most momentous questions in obstetrics. Fortunately it is one not often presented to us for solution in practice. What are the circumstances under which abdominal hysterotomy may become justifiable or even necessary? No point has been more keenly debated, and perhaps no point of importance in midwifery is less definitely settled at the present time. There can be no doubt that the operation is less held in dread upon the Continent than in Great Britain. This is owing in some degree to the more favourable results of the operation, and to the greater value attached to fœtal life, in foreign countries. According to Busch and Moser, the Cæsarian section is the only practical mode of delivery when the diameter of the pelvis is two inches and a quarter or less, and the Cæsarian section is indicated if the diameter is from two and a quarter to under three inches, when the child is alive. Jacquemier is of opinion that hysterotomy is the only justifiable operation when the child is dead, and the pelvis is below two inches in diameter; or when, in the case of a live child, it varies from two inches to two and a half. These are amongst the latest authorities in Germany and France. Velpeau gives the diameter of the pelvis in 62 cases. In 30 of these, the pelvic diameter was from two inches to two and three-quarters, the variation in the remaining 32 being from one inch to two inches. Dr. Simpson truly observes that in this country the operation would not have been performed in the 30 cases in which the diameter extended from two inches to two inches and three-quarters. These measurements, it should be stated, refer to the antero-posterior diameter, and it seldom happens but that, on one side or the other of the pelvis, the diameter exceeds the diameter from the promontory of the sacrum to the symphysis pubis. In such cases, craniotomy would certainly be performed in British practice. Dr. Lee, the most strenuous opponent of the Cæsarian section, avoids giving any positive admeasurement limiting the operation, but he states that the operation should be reserved for cases in which the pelvic contraction is so great that the os uteri and the presenting part of the child are entirely out of reach. He speaks, however, of a case of Sir Charles Bell's, in which the antero-posterior diameter did not exceed an inch, and when the space on either side did not allow of the performance of craniotomy, in which, in labour at the full term, the Cæsarian section was necessarily performed. Dr. Fleetwood Churchill gives it as his conclusion, after reviewing all the points relating to the subject, that when the antero-posterior diameter of the brim is not more than an inch and a half, there is no resource but the Cæsarian section. Dr. Rigby considers the operation unavoidable when the child cannot be extracted piecemeal through the natural passages, but does not give any positive measurements which would justify the operation. Dr. Meigs teaches that the operation may be imperative in different diameters in different cases; and he considers it impossible to fix a minimum diameter through which a woman may be delivered. He states that if we go to diameters of an inch or an inch and a half, the Cæsarian section is inevitable, but that he should not hesitate in one case to recommend it in a pelvis the diameter of which ranged from two to two and a half inches, when a patient was in imminent danger; while in another, and less pressing case, he would as certainly, with the same diameters, advise craniotomy. Singularly enough, Dr. Meigs relates a case where the diameter was not beyond two inches, in which he delivered by embryotomy on two occasions, but in which the Cæsarian section was afterwards performed twice successfully, and once under the sanction of Dr. Meigs. No alteration had occurred in the state of the pelvis between the dates of the operations for embryotomy and hysterotomy. Dr. Ramsbotham considers the Cæsarian section the only alternative in labour at the full term, when the antero-posterior diameter is one inch and three-eighths, and a space of three inches and a half at the brim laterally, or with an antero-posterior diameter of an inch and a half by three inches. In two of the cases occurring in London within the last few years, the pelvic diameters have been published. In one case the antero-posterior diameter was three inches, but out of this the rami of the pubis projected forwards, with a beak more than an inch in length and about an inch in breadth. The distance between the tuberosities of the ischia was 1·2, and from the point of the coccyx to the symphysis pubis 2·8 inches. The child was saved. In the other case, the principal deformity was at the brim. The antero-posterior diameter measured two inches. From the sacral promontory to the right pectineal eminence there was also a space of two inches, and from the same point to the left pectineal eminence, two inches and a half. The diameters of the cavity and the outlet were not seriously contracted. The child was dead before the commencement of the operation. It is impossible to give too much credit to the distinguished practitioners concerned in these cases for their candour and skill, but it may be questioned whether in both cases delivery might not have been effected by piecemeal delivery. At this point of the argument, we must inquire what are the smallest diameters through which a child at the full term has compassed, either alone or with instrumental assistance. We have seen that Dr. Meigs delivered twice in a case where the antero-posterior diameter did not exceed two inches, and he distinctly states that he should not hesitate to undertake delivery in any pelvis of two inches in the antero-posterior diameter. I believe Dr. Lee entirely endorses this opinion, even if he does not go somewhat beyond it. In the celebrated case of Eliza Sherwood, in whom delivery was effected by Dr. Osborn, the antero-posterior diameter was only three-quarters of an inch, but there was a space on the right side an inch and three-quarters broad and three inches long. In the case related by Dr. Simpson, a fœtus, eighteen inches and a half long, passed through a cordate pelvis, so contracted at the outlet as to measure three inches from the coccyx to the symphysis, but only half an inch from the tuberosity of one ischium to the other. In a succeeding labour, hysterotomy was performed with a fatal result to the mother and child. In these and other cases of the passage or extraction of a child through a pelvis affected with high distortion, the child has been dead and in a softened condition, with complete separation or dislocation of the bones of the head. It may be said, then, that the limits for the performance of the Cæsarian section only ranges between a two-inch diameter of the pelvis from deformity, and its entire occlusion by exostosis. If cases can ever occur in which the operation is necessary above two inches, they are instances in which death is threatened or certain, before the lengthened operation of embryotomy could be completed. Much discussion has taken place as to the relative value of the life of the mother or child in cases supposed to call for hysterotomy, particularly when the child has been sacrificed again and again in the same subject. But, apart from the fact of the great danger to the child in cases of the Cæsarian section, I think the judgment of Dr. Meigs to be in accordance with the dictates of reason and humanity, when he says that this operation should never be performed upon the living subject, save for the preservation of the mother herself, and that it should be considered essentially as a mother's operation, only to be resorted to when the life of the mother is in greater danger from the continuance of labour, than from the hazardous and almost certainly fatal procedure under consideration. The life of the child may be a great consideration *after* the operation has been decided on, but it should hardly enter into our calculations *before* that time.

When a patient has died suddenly, or in any other way, during labour, or in the latter part of pregnancy, there can be no hesitation about the performance of hysterotomy, where the child is suspected or known to be alive. Under such circumstances, the operation should take place as quickly as possible after the death of the mother. It was probably in such cases that the operation was in the first instance performed. I have elsewhere spoken of the performance of gastrotomy in cases of ruptured uterus, where the child has escaped into the peritoneum, and cannot be delivered *per vias naturales*. This operation is also necessary in some cases of extra-uterine fœtation, when death is threatened from the irritation of the fœtus.

Hysterotomy is not a difficult operation. The temperature of the room should be raised, with a view to the prevention of peritonitis, and chloroform administered, unless some special contra-indication exists. The abdominal incision may be made in the direction of the linea alba, or it may be oblique or horizontal, according as the configuration of the abdomen is altered by deformity. The situation of the placental attachment should be avoided, if this organ be attached anteriorly. This may be learnt by auscultation before the operation is commenced. Great care is required in opening the peritoneum, so as to avoid wounding the intestines. The abdominal incision should be from eight to ten inches in length; and the uterine incision should be of nearly the same length. Some have advised that the liquor amnii should be evacuated before the commencement of the operation. When the amnion is punctured through by the uterine incision, care must be taken to let as little of the fluid as possible enter the peritoneal cavity. It is recommended to be removed carefully with pieces of sponge or a syringe. When this has been evacuated, the fœtus is to be taken out cautiously, as in some cases the uterus has grasped the body or neck of the child at the wound, and rendered its extraction a matter of difficulty. The placenta is to be separated by the hand, and hæmorrhage arrested by mechanical pressure, or the application of cold, the risk of peritoneal inflammation being the only objection to the latter. After the removal of the placenta, and the cessation of hæmorrhage, all blood and fluid are to be carefully removed from the peritoneum, and the edges of the uterine and abdominal incisions brought together and maintained by sutures. The external wound is further to be dressed lightly with strapping and wet lint, and the whole supported by a many-tailed bandage, space being left for the exit of discharge. After the operation, large and continued doses of opium, with nutriment and stimulus in good quantity, appear to offer the best chances of recovery. Throughout, every care should be given to the avoidance of peritoneal irritation as far as possible; the escape of the bowels through the wound; and the suppression of hæmorrhage. Dr. Aitken has recommended that the operation should be performed under water, with a view to defend the peritoneum and other structures from contact with the external air, but I am not aware that his suggestion has been carried out in practice. As already mentioned, art and the most careful modes of operating, can do little towards insuring the safety of the patient under hysterotomy. There is one point worthy of consideration which has been already referred to—namely, that patients operated upon in the country have done better than those operated on in great cities; and it is probable that a good air does more than the most skilful surgery in such cases.

I have already expressed the opinion that Chloroform is of very great value in all the more important Obstetric Operations, when no contra-indication to its employment exists. I believe especially, that it enables the accoucheur, under many circumstances, to turn or deliver by the forceps where, but for its use, he would have to resort to craniotomy. Anæsthesia must, it appears to me, be recognised as being quite as important in operative midwifery as it is in operative surgery.

As regards the employment of Chloroform in Ordinary Labour, the current of all experience, since the invaluable discovery of its anæsthetic properties by Prof. Simpson, has been to show its general safety and utility. At its first introduction, I had scruples as to its use, but I have now no hesitation in employing it whenever the pains of labour are severe, and when the patient and her friends desire it. There are, however, certain circumstances which I have seen reason to bear in mind in its administration. Although it is often of very great value in producing sleep and quiet in puerperal mania, I believe I have seen insanity caused after delivery by its liberal employment in some cases. I have also seen it suspend uterine action, and I would therefore be cautious as to its use in cases of uterine inertia or in patients subject to hæmorrhage after labour. Some of the worst cases of laceration of the perinæum which I have seen have occurred in patients delivered under the influence of chloroform. This agent is without doubt useful in relaxing the os uteri and the perinæum. But in cases of rigidity of the perinæum, the existence of pain and full consciousness causes the patient to exert, by the controlling influence of volition, a power over the peristaltic and reflex actions of the uterus and respiratory muscles, which retards the passage of the head to such an extent as to preserve the perinæum when patients are insensible to pain, but retain some amount of consciousness. They will often make greater efforts than usual at the time the head presses on the perinæum, and urge it through the ostium vaginæ with such force as to tear up the perinæum. Greater care, therefore, than usual should be taken when using chloroform, to prevent the too rapid birth of the head.

In the employment of anæsthesia in ordinary labour, the same objections to its use in cases of fatty heart or diseases of the respiratory organs obtain, as those which apply to the general operations of surgery. The anæsthesia need not, however, in the practice of ordinary midwifery, be so profound as in surgical operations or in the operations of midwifery. I believe the best method of administering it is that which is employed by the discoverer of its anæsthetic powers—namely, to pour a little chloroform on a towel or napkin, and suffer the patient to inhale it at the commencement of every pain.

CHAPTER XLVIII.

CONCLUSION.

Having considered the principal subjects which relate to the Anatomy, Physiology, and Pathology of the Reproductive Processes, I propose to devote the present chapter to the causes of the mortality which attends parturition and the puerperal period, and to the modes by which the amount of this mortality may be diminished. The latter forms the end and aim of all improvements in the Theory and Practice of this department of Medicine.

The Seventeenth Annual Report of the Registrar-general of Births, Deaths, and Marriages in England, published during the present year, contains a letter on the causes of death in 1854, by Dr. Farr, the eminent vital statistician, in which the mortality of women in childbearing is very ably handled. From this document it appears that during the eight years from 1847 to 1854, inclusive, to every 10,000 children born alive in England and Wales, 54 mothers died. This makes a maternal mortality of nearly 1 in every 189 deliveries. In the seven years no less than 3232 mothers died, on the average, annually. It is a gratifying fact, that in the seven years the mortality decreased from 60 in 10,000, in 1847, and 61 in 1848, to 47 in 10,000 in 1854. Since 1848 the declension has been progressive, the numbers per 10,000 being 58, 55, 53, 52, 50, and 47. Still, in the most favourable year, 1854, 3009 women died either during childbirth, or in the puerperal period—an enormous fatality to attend the performance of a natural function. The most minute particulars in his report relate to the year 1852. In that year there occurred in this country 617,902 childbearings, and the number of women who perished was 3247. We may at the present time consider 3000 per annum as the number of women destined to perish from childbirth in England and Wales. This mortality, it must be remembered, refers to women in the prime of life, who, up to the time of labour, enjoy excellent health. From the numbers given in the seven years, out of every 100,000 childbearings, 530 women died from causes incident to labour. In the year 1848, 61 mothers died to every 10,000 children born alive. For the year 1852, we have the exact number of childbearings given. In this year 617,902 women were delivered. Of these, 3247 died in childbirth, or in the puerperal period. The estimated number of still-born children was 22,122. The deaths from childbearing bear a considerable proportion to the entire mortality during the childbearing period—viz., from the ages of 15 to 55. Amongst women of the age 15—25, the annual mortality per cent. from all causes was ·861, of which the $\frac{1}{21}$st part, or ·41, is by childbirth. At the ages 25—35, and 35—45, the annual mortality per cent. from all causes was 1·090 and 1·296, of which ·098 resulted from childbirth. Thus between the ages 25—35, 1 in every 11 deaths from all causes is from childbirth. At the age 35—45, 1 out of every 13 deaths is from childbirth, and in the case of women of the age 15—25, the mortality is increased by childbirth in the ratio of 5 to 9. It is difficult to put the mortality from parturition in a stronger light than this. In the English schedule there is as yet no column for the ages of the parents of the children registered. In the Swedish returns this defect does not exist, and Dr. Farr has determined the deaths from childbirth, at the respective ages as they occur in this country, by applying the data drawn from the Swedish tables to our own. The results show that a definite law governs the calamitous deaths of childbirth. Between the ages of 15 and 25, the maternal mortality, as already stated, amounts to 668 in every 100,000, in childbirth. In the second childbearing decenniad, from 25 to 35, the mortality from parturition is only 425 in 100,000 labours. It rises to 633 per 100,000, between the ages of 35 and 45, and to 883 in the last decenniad, namely, from 45 to 55. It is in the first decenniad that the largest proportion of first births occur; but more than one-half of the deliveries which take place at all ages, occur between the years 25 to 35. This is, in fact, the great childbearing epoch, and the age at which parturition is most safely performed. At the age of 15 to 25, one woman out of every sixteen bears a child in the year. At the age of 45 and upwards, the number bearing children is inconsiderable, but from the age of 25 to 35, one woman in every four bears during the year in this country. The most fatal decenniad is the last, between the ages of 45 and 55, when the deaths are more than double the proportion of the deaths occurring in childbirth between 25 and 35. The female population between the ages of 45 and 55 is estimated at 782,010; of these, 7545 are computed to bear children in the year, and a fatal result occurs in 66 cases, or at the rate of ·883 per cent. The comparative mortality in the four decenniads may be represented by the figures 3, 2, 3, and 4. This increase in the mortality from parturition at the two extremes of the childbearing epoch is in accordance with the results of common observation. All radical defects and deformities in the childbearing organs are tested in first pregnancies, and it is in the first and last periods that rigidities of the soft parts are most marked. Towards the end of the childbearing period, women then becoming pregnant for the first time have their peculiar dangers; while in women who have borne numerous children, and in whom the reproductive organs are worn out, as it were, the results of uterine inertia, and the occurrence of rupture of the uterus, from its imperfect development in later pregnancies, increase the mortality. Other affections, such as fibrous tumours and mollities ossium, also increase in importance as impediments to labour, towards the close of the childbearing epoch. It may be observed that in all returns relating to obstetrics, the amount of mortality from causes connected with childbearing are rather under than over stated, from the natural repugnance of practitioners to refer to this condition as a cause of death.

If we come to inquire into the special causes of death from parturition, we find Metria or Puerperal Fever to be the monster source of childbirth mortality, when compared with any other single disease or accident attending labour. In the eight years 1847-55, 25,868 mothers died in childbirth; of these, 8154 perished from puerperal fever. More than 1000 women die annually in England from this cause alone. The particulars of this are set forth in the following table:—

Deaths of Women in Childbirth in the Eight Years 1847–54.

YEARS.	Number of deaths from			Deaths of mothers to 10,000 children born alive.
	Metria and other causes.	Metria, or puerperal fever.	All other accidents of childbirth.	
1847 …………	3226	784	2442	60
1848 …………	3445	1365	2080	61
1849 …………	3339	1165	2174	58
1850 …………	3252	1113	2139	55
1851 …………	3290	1009	2281	53
1852 …………	3247	972	2275	52
1853 …………	3060	792	2268	50
1854 …………	3009	954	2055	47
8 Yrs., 1847–54	25868	8154	17714	54

After puerperal fever, hæmorrhage and exhaustion, the operations of midwifery, rupture of the uterus, puerperal mania, and convulsions, are the principal causes of death. Certain diseases quite distinct from parturition, such as small-pox or scarlatina; and visceral inflammations, such as idiopathic peritonitis, cardiac, pulmonic, and cerebral inflammations, are vastly increased in danger by the concurrence of pregnancy or parturition. Statistics yield some interesting and important facts respecting the ages at which metria and the other disorders and accidents of childbirth are fatal in different proportions. These facts are exhibited in the following table:—

Comparative Mortality of Women bearing Children at different Ages, from Metria and all other Causes, in the Seven Years 1848–1854.

Age of mother.	Deaths by metria.	Deaths by other accidents of childbirth.
15 — 25 ………	2085 ………	2939
25 — 35 ………	3401 ………	6378
35 — 45 ………	1791 ………	5566
45 — 55 ………	86 ………	380
15 — 55	7363	15,265

Thus it appears that during the first childbearing decenniad, 15—25, somewhat more than two-fifths of the childbed mortality is from metria or puerperal fever; but under this head all inflammatory disorders of the uterus are probably included. In the second decenniad, 25—35, rather more than one-half of the deaths of women in childbirth are attributable to metria. In the third decenniad, 35—45, rather less than one-fourth of the deaths take place from metria, the proportion being 1791 from fever to 5568 from the other accidents of childbirth. In the limited number of cases occurring in the fifth decenniad, a still smaller proportion of deaths from metria is observed. It results that between the ages 15—35, women are greatly more susceptible of puerperal fever than between the ages 35—55. On the other hand, while between the ages 35—45, and 45—55 the chances of death from puerperal fever are diminished, those of death from the other accidents of childbirth are increased in a still greater proportion. The great era of puerperal fever is before the age of 35, when it exceeds one-third of the total deaths from childbirth. After the age of 35, the other accidents and disorders of childbirth largely exceed puerperal fever in importance, the proportion in the seven years being 5998 from the ordinary accidents and disorders of childbirth, and only 1877 from metria. I am not aware that the attention of obstetricians has ever before been drawn to these remarkable facts in connexion with death from childbearing. That they have a practical bearing of the first importance, is at once obvious.

We have seen that the great single cause of death amongst childbed women is Metria, or Puerperal Fever. There can scarcely be any hesitation in declaring that this disease ought hereafter to be as absolutely extinguished in this country as the plague of former times! It stands in the same category as typhus, and the rest of the zymotic diseases, which we may reasonably hope are in gradual process of extinction by preventive medicine. This extinction, if possible, cannot but be hastened by the earnest direction of the professional mind to the subject, since it is one which is very much within the control of medical men. As regards cure, or effective treatment, the disease in its various forms is utterly beyond all the known resources of our art; and there is no reason to imagine that we shall ever deal with it effectually, save in the way of prevention. In this point of view, everything in the history of the disease leads us to the conclusion that its virulence and frequency may be moderated to almost any extent, and that it may even, in process of time, be entirely annihilated.

And, first, as regards the Sporadic origin of this disorder. The state of the lying-in woman is one in which, as we have seen again and again in the present Chapters, the blood and secretions are necessarily vitiated to a certain extent. Puerperal fever may almost be produced at will, by crowding a number of lying-in women together in the wards of a lying-in hospital. It is generated in individual cases, by inattention to the lochial and other secretions, the absence or neglect of ventilation, in the small rooms of the poor, where the lying-in chamber is often the abode of the rest of the family, and is used for all domestic purposes. In fact, where there is risk of typhus to the non-gravid woman, there then is more than an equal amount of danger of metria to the puerperal woman.

In the way of Infection and Contagion it may, I think, be demonstrated, that puerperal fever may be carried from one patient to another by the proximity of lying-in patients, and by attendants and nurses conveying the infectious principle from one patient to another. There can be no doubt whatever that the exposure of a lying-in woman to the influence of the fomites or other impalpable or material agencies, derived from erysipelas, typhus, hospital gangrene, scarlet fever, small-pox, decomposing animal bodies, especially of persons who have died from any form of fever or inflammatory disorder, and other conditions, conveyed to the lying-in woman by the breath of those about her, or the hands and clothes of her attendants, will produce the disease. When the disease prevails in lying-in hospitals, and acquires a certain virulence, it is apt to prevail epidemically, all the lying-in women exposed to the danger becoming affected; and it is believed to prevail in certain districts and seasons, as an epidemic apart from all influences of contagion and infection.

The prevention of Sporadic cases belongs in part to the general sanitary questions of dwellings for the poor, draining, ventilation, water-supply, and other matters bearing upon the physical condition of the poorer classes of society; and in part to the attention given to cleanliness, the removal of morbid secretions, and other removable causes of disease, in individual cases. As regards lying-in hospitals, it may be questioned whether they have not proved in many respects an injury, instead of a blessing, to those classes they are intended to relieve, and certainly I believe the feeling of the profession is against any extension of the system of lying-in hospitals. They have demonstrated more emphatically than the facts derived from any other source, that puerperal fever is a contagious and a preventible disease. A large amount of the mortality from puerperal fever in large cities has occurred within their walls, and from these institutions it necessarily spreads by medical attendants, nurses, patients, and wet-nurses, to other lying-in women. It is evidently unsafe to congregate lying-in women, in any numbers, in the same building. This is the opinion of Dr. Robert Lee. Dr. Simpson has suggested that lying-in charities should consist of detached buildings rather than of hospitals. Dr. Ramsbotham declares himself very emphatically against such institutions, and relates that he once refused a valuable appointment in a proposed new charity of this kind. Drs. Lever and Oldham, when the managers of the splendid income of Guy's proposed to erect a new lying-in hospital, exerted their influence against the origination of such a building. Dr. Copland, who for a long time held an appointment as consulting physician to a lying-in hospital, has given a very emphatic opinion respecting the dangers arising from such institutions. There can be little doubt that the suppression of such hospitals would effect a great saving of human life. No care that ever yet has been devoted can render the mortality in lying-in hospitals in this country as favourable as the mortality amongst women confined under the most miserable circumstances at their own homes. Meantime, while lying-in hospitals exist, every care should be given to the ventilation of the wards, the allotment of sufficient space to each patient, and the removal of infected patients to separate wards. It has always been the laudable practice, when puerperal fever has prevailed in lying-in hospitals, to shut up infected wards, or to close the institutions altogether. What applies to lying-in hospitals, holds good also with respect to the admission of lying-in patients into the wards of general hospitals.

As regards the care of individual childbed women with reference to the sporadic development of metria, much depends upon the nurse. It is in this respect of the highest importance to have trained and educated nurses, understanding the subjects of diet and ventilation, and made well aware of the importance of cleanliness in all that relates to the management of the lochial and lacteal secretions. I have already referred to the relation of questions of drainage, the construction of dwellings, and other sanitary matters, to the sporadic production of puerperal fever. In this particular concern our profession is at present very much at the mercy of the public. We are not responsible for the great causes of zymotic disease which exist. With the improvements in our sanitary arrangements, puerperal fever will diminish like other diseases of the same class, or become far more easy of prevention.

When epidemic puerperal fever, or the conditions which give rise to it, exist, what can be done to prevent its development or extension? It has been proposed to keep lying-in women in suspicious circumstances, constantly under the influence of quinine, iron, or some other tonic or antiseptic remedy. But the extent of the powers of such medicines are matters rather of reasonable supposition or belief than of actual proof. I should be disposed to place great confidence, from what I have seen of its use, in the chlorate of potash as a prophylactic against puerperal fever, in doses of from five to ten grains three times a day. This drug appears to act by liberating in the economy the oxygen and chlorine it contains.

In considering the spread of puerperal fever by Infection and Contagion, the different circumstances under which the poisonous element is circulated must be borne in mind.

It is obvious that women who are in the latter months of pregnancy, and in whom delivery may be expected from day to day, should be secluded as far as possible from proximity to patients suffering from the exanthemata, erysipelas, hospital gangrene, scarlet fever, putrid sore-throat, or any other disorder the miasm of which admits of conversion into the puerperal poison, and that any indirect communication by third parties or in any other way should be prevented to the greatest practicable extent. The relations of Medical Men, Students, Midwives, and monthly Nurses, to the propagation of puerperal fever, require separate notice.

According to the present arrangements of our profession, there is no class of medical men exempt from the risk of conveying to puerperal patients, infectious or contagious matters from disorders capable of producing metria. Those who practise midwifery as a specialty, may meet with sporadic cases of puerperal fever capable of furnishing infectious matter, or they may be called to see cases of puerperal fever in consultation. Men holding hospital or dispensary appointments are also obliged to see the puerperal patients of such institutions. Surgeons in general practice, necessarily attend cases of infectious disease, convertible into metria, when conveyed to the lying-in woman. Surgeons holding hospital appointments, who perform operations and practise midwifery, as Dr. Simpson has forcibly pointed out, have to deal with lying-in women, and also with cases of an infectious and contagious nature, such as phlebitis or erysipelas. If students attend midwifery cases while their anatomical and surgical education is going on—and it is difficult to seclude themselves entirely from such subjects—they unavoidably expose patients to the risks arising from their dissections; from their attendance upon medical and surgical hospital practice; and also their pathological studies. Midwives frequently convey the disease from one patient to another, and the same may be said of monthly Nurses.

Since it is impossible, or next to impossible, considering the frequency of infectious or contagious diseases, for any man in practice to escape entirely from the risks of infecting or inoculating lying-in women, especially when such patients are under circumstances favourable to infection or inoculation, the question arises as to the best mode of rendering these risks nugatory, or of destroying them altogether. In the Chapter on Puerperal Fever I have given the evidences which appear to me to prove that the blood and breath of the practitioner is a very common medium of infection. This would point to the propriety of neither going nearer to, nor remaining longer in, the vicinity of a patient suffering from puerperal fever, or any convertible infectious disease, than is necessary; and of not approaching so near to a recently delivered woman as to expose her to danger from the breath. Where the presence of infection is very evident, the propriety of changing the clothes is obvious, and generally practised; and many expose their clothes to the fumes of chlorine after exposure to risk. After touching any wound or purulent surface, the hands should be not merely washed, but washed in a solution of chloride of lime, or some other disinfecting fluid. It would only result in good and in confidence on the part of patient and practitioner, were the practice common, if the hands were habitually washed in a solution of chloride of lime before attending a labour, and, in suspicious circumstances, before and after every vaginal examination. The fingers of the practitioner are evidently a fertile source of contagion. Dr. Simpson compares the fingers of an accoucheur who has been touching wounds or pathological specimens to the armed points used in vaccination. The small amount of matter conveyed by the hand, which is capable of producing disease, is almost incredible. A practitioner has been known to have an outbreak of puerperal fever in his practice,—to have freed himself by absence from home, so as to have attended cases without risk,—and then to have had a second outbreak after wearing a pair of gloves which he had worn during the first attack. It has been recommended that gloves should not be worn at all by accoucheurs, and certainly, considering the interests at stake, no precautions can be too minute under circumstances of suspicion. Keeping the nails closely cut, is another point worthy of attention. The condition of the utero-vaginal canal is, it must be remembered, the most favourable which can be conceived, for inoculation. The mucous surfaces are in a state of high excitement; abrasions and slight lacerations of the vagina and perinæum are extremely common. The removal of epithelium from the surface of the os uteri, at the time of labour, is almost universal, and it is to this part, of course, that the finger of the accoucheur is necessarily directed during his examinations. With respect to the attendance of students on cases of midwifery, some time ought to be set apart for their attendance upon midwifery cases, during which they should neither dissect nor attend the wards of the hospital, or the deadhouse. The dangers arising from the attendance of students upon lying-in women, when they are dissecting and attending autopsies, is exhibited in the most startling form by the statistics of the great Vienna lying-in hospital. In this institution, in the six years from 1840 to 1846, 22,120 women were delivered. Of these, 2260 died; the mortality being in the enormous ratio of 1 in every 10. The mortality has since been reduced to 1 in 74, and the reduction has dated from the time when Dr. Semelweiss enforced the regulation that every student should, before and after each vaginal examination, wash his hands in a solution of chloride of lime, and also interdicted the students from touching dead bodies.

As regards the deaths arising from accidents and other disorders during childbirth, there is also much hope of diminishing the amount of mortality. Everything points to the importance of only allowing qualified persons or advanced students to attend women in parturition. In no other circumstance or operation whatever, where the mortality was 1 in 189, would ignorant women or unqualified persons be allowed to practise. The common feeling has been, that any one might safely attend a woman in middle life who had already borne children; but the tables I have given show that rather more than 800 women perish in England yearly from the various accidents and diseases of childbirth, between the ages of thirty-five and forty-five. The attention and anxiety of practitioners are commonly given to first labours; but statistics show unerringly that the greatest and most fatal risks from accidents, &c., attend the delivery of women who are mothers of families, and above the age of thirty-five. It is in these women that death occurs most frequently from hæmorrhages, puerperal mania, rupture of the uterus, exhaustion, &c., while they are comparatively exempt from the danger of puerperal fever. On the other hand, our care in guarding young lying-in women from their greater risk of taking metria should be most unceasing. The proportion of deaths from hæmorrhage are very large. As far as the statistics from which I have quoted are available, the deaths from flooding alone are more than 10 per cent. of the total deaths in childbirth. Now, there can be no doubt that, with the appliances and means we at present possess, this large item of childbed mortality might in the hands of educated obstetricians be greatly diminished, and that death from flooding ought rarely to occur. Another large reduction might be made by substituting the induction of premature labour, or turning, or the forceps, but especially premature labour, for craniotomy. By the employment of turning or the forceps, the mortality is considerably diminished: but by the induction of premature labour the risk of death to the mother from the performance of craniotomy becomes very slight indeed. We have seen that in almost all cases the induction of abortion or premature labour might, by the exercise of foresight, be substituted for craniotomy. Taking the annual number of deliveries—the proportion of craniotomy cases—and the scale of mortality from this operation, we have the data for an approximative estimate of the maternal mortality caused by craniotomy in England. This would amount to nearly 400 deaths per annum from this cause alone, all or nearly all of which might undoubtedly be averted. The judicious use of chloroform, especially in serious obstetric operations, will no doubt tend to the diminution of childbed mortality.

In concluding the present work, I cannot but look forward to the time when the present mortality from childbearing will be greatly lessened. This is a subject in which we of the present day must bear our part, and it is consolatory to know that every succeeding generation of students and practitioners will come to the work with added means of science and experience, until at length we may hope that no unnecessary mortality shall take place in parturition.

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